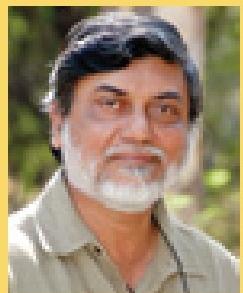


This second edition of the book presents a unique scientific perspective on the nature of human thought, its production, transmission and interaction with matter. A conceptual framework is attempted to show how deep human thought, space, time, matter and Universal Consciousness are related. The nature of thought and mind control according to ancient Patanjali Yoga Darshan is explained in the light of modern brain research and cosmology. The book provides a beautiful blend of Indian philosophical thought and modern science.

Dr. Rajvanshi brings into these essays a deep scientific insight on the nature of human mind and shows how the cultivation of deep thought can help us on the path of spirituality so that we can live a happy and sustainable life. The essays also explore the relationship between spirituality, science and technology and show that they go hand in hand and are necessary for a sustainable and emotionally satisfying world.



Anil K. Rajvanshi is a Mechanical Engineer by profession. He received his Bachelor of Mechanical Engineering from IIT, Kanpur and his Ph.D. from University of Florida, Gainesville, USA. He and his wife Nandini Nimbkar (also a US - trained scientist) run a small science and technology based NGO called Nimbkar Agricultural Research Institute (NARI) in Phaltan - a taluka town in rural Maharashtra (www.nariphaltan.org). He does research in the areas of renewable energy, rural and sustainable development, and spirituality and has written and published extensively on these issues in national and international publications. He has more than 160 publications and 7 patents to his name and has won many prestigious National and International awards for his rural development work. He is also the author of the book "1970s America-an Indian Student's Journey" which is about his experiences in US as a student and a teacher.

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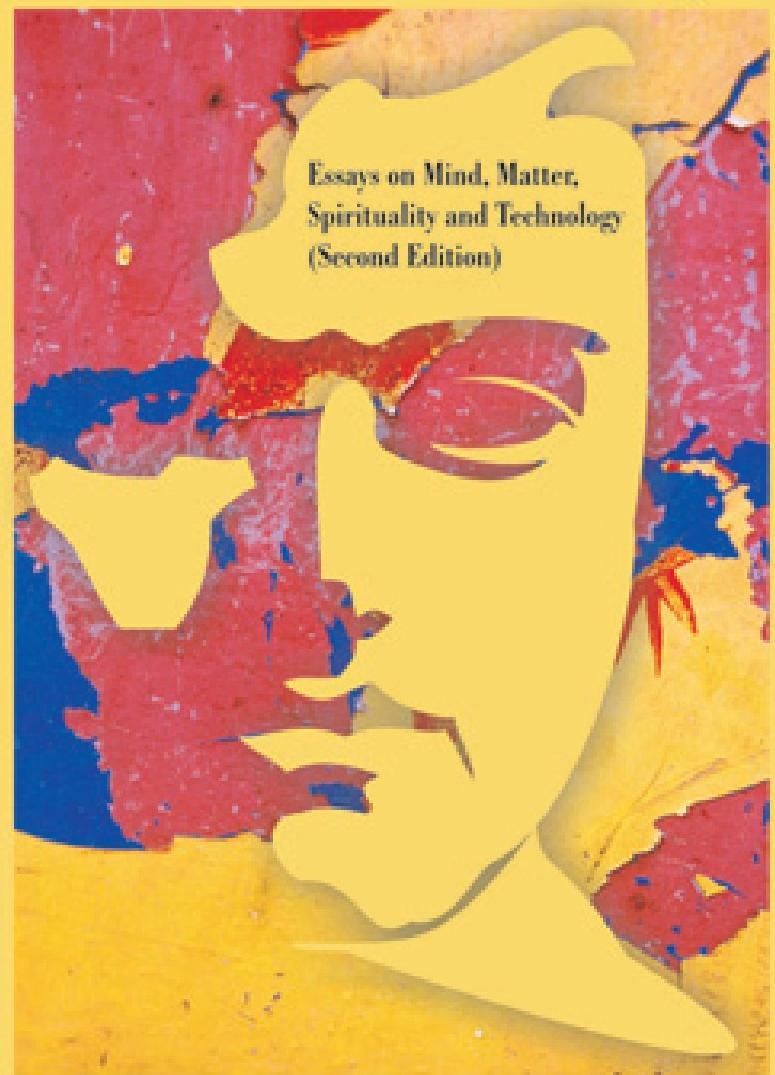


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Nature of Human Thought

Anil K. Rajvanshi

Nature of Human Thought



Anil K. Rajvanshi

The combination of science-technology with spirituality has been a riddle for mankind since the inception of modern science. With the tremendous development in technology in the last century, it has become almost impossible for a common man to stay away from its fold. At the same time, it is a proven fact that mere material development doesn't lead to complete fulfillment in human life; spirituality is the answer. A scientific man tries to find solutions to his problems externally or objectively, while a spiritual person does so internally or subjectively. How to amalgamate these two aspects of life is the challenge for a modern man. The author tries an attempt to this end in his well-drafted book 'Nature of Human Thought'.

He pins his faith in the spiritual science of ancient India, especially the Patanjali Yoga Sutras, which is a treatise on Indian Psychology defining and explaining the different aspects of mind-control and self-realization. The science of Yoga teaches the techniques of concentration and meditation so as to control and transcend the mind. The author calls this 'deep thought' and tries to explore the mind/matter realm along with its interaction with space, time, etc., with the help of modern scientific discoveries.

The book is divided into three main sections called 'Basic Theme', 'Deep Thought, Happiness and other things' and 'Spirituality, Technology and Sustainability'.

In the first section, the author tries to explain the nature of human thought with the help of neurology, Magnetic Resonance Imaging (MRI), Chaos Theory, etc., concluding that the thought can be considered as a dissipative structure produced by the firing of a large number of neurons. Along with it the production of deep thought is explained by the yogic method called '*Sanyam*', which is the result of sustained and willful practice of meditation and yoga. The author then traces the deep thought in higher dimensional space and explains the process of gaining knowledge via thought packets, sensing thought signals, and the interactions of mind/matter with the forces of gravity, and shows how Time, Space and Universal Consciousness are related. Next the different facets of the art and science of happiness is explained giving emphasis on the sublimation of desires so as to develop a powerful brain with heightened awareness. The

theory of death, karma and reincarnation is also explained with references from both Indian spiritual tradition and the modern research.

In the second section, the same ideas are further developed from different angles citing examples from the lives of saints, scientists and scriptures. The author here tries to establish how the cultivation of deep thought helps us become spiritual, happier and better human beings. Interestingly, the various aspects of dreams and sleep are examined in the chapter 'Designer Dreams through Yoga' showing how synchronized and deep thought leads to prophetic and solution dreams. Deep thought is also produced by deep faith, which helps overcome fear and can even do miracles. The various facets of happiness are pondered upon based on natural evolution, human free-will, choices in life, etc., so as to equip ourselves to rise up for a better world.

In the third section, the right use of technology along with spirituality is stressed for enhanced growth in all walks of life. The conquest of Nature using technology understanding its great laws helps mankind to unravel its mysteries, and thereby apply them for the betterment of human life. The author points out that technological progress and spiritual progress go hand-in-hand in the evolutionary advancement of a society. At the same time, the abuse of Nature has to be prevented in every front to preserve the balance of ecosystem. Hence conservation of Nature is of grave importance for sustainable living. It is only through spiritual growth that human beings can understand this vital fact and live harmoniously with Nature.

The author has tried to practically implement these ideas of spiritual living with technological simplification in his projects of rural development. Nimbkar Agricultural Research Institute (NARI), the NGO run by the author in a rural town called Phaltan in Satara district, Maharashtra, India, has done commendable work in improving the quality of life of poor people. Some of the experiences gathered by the author during these experiments are discussed with valuable suggestions for the future, which makes this book an inspiration for further research. Hope to see many more editions of the book in the coming times.

SWAMI SHANTACHITTANANDA,
ADVAITA ASHRAMA, KOLKATA



Nature of Human Thought

Essays on Spirituality, Technology and Sustainability

Second Edition Revised and Expanded

Anil K Rajvanshi

NARI

Nature of Human Thought
Essays on Spirituality, Technology and Sustainability

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All proceeds of the sale of this book will go towards the charitable purpose of setting up a Center of Sustainable Development at NARI

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Readers' Comments on First Edition

I enjoyed your book. Thank you for sharing it with me.... I liked very much your self-as-teacher explanation and have always believed in this concept.... I also enjoyed the parables and stories in the book.... Thank you for sharing your work and congratulations in its writing. It is very thought provoking.

Phil Larocco, President E & Co, New Jersey, USA

"One of the best books I have read.... If one reads the Preface, it is impossible to keep the book down.... The ideas are brilliant. If one can prove some of the ideas given in your book he/she will get a Nobel Prize.... I must thank you for sharing with me your brilliant book".

*Dr. R. C. Maheshwari, Vice Chancellor, S. D. Agricultural University,
Gujarat, India*

"I still refer to your wonderful book from time to time. One of the most impressive I have read in my lifetime!

*Barbara Harwood
Principal, Don Aitken & Associates, California, USA*

"I have to say that this book is one of the best and unique books that I have ever read. It has tried to answer all my secret questions. Some of the essays have been very relevant to me like prepared mind gets universal knowledge; Deep faith overcomes fear, Music and happiness, sensing thought signals. I have had some experiences in the past for which I could not find any answer, the book answers all that. I wish to attend your public lectures if they are held either in Pune or Mumbai."

Rakesh Kadam, Nasik

This book is dedicated to my parents Jagdish (late) and Hemlata Rajvanshi who helped create an environment, which was conducive to my early spiritual leanings.

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Preface to the Second Edition

The first edition of this book was well received by the readers. However there was a general refrain that the book is very concise, precise, "heavy" and hence difficult to understand.

Also since the publication of the first edition in 2004, I have published many more articles on the general theme of spirituality, technology and sustainability. Hence I thought of revising the book so that the theme chapters are easier to understand and have added these new articles in various sections. Thus the theme of how spirituality with technology leads to sustainability is further strengthened.

In last few years I have been giving inspirational lectures to students of various Indian institutes like IITs, Regional Institutes of Technologies (RITs), etc. Since these lectures were a mixture of technology and spirituality, I have decided to amalgamate all of them into one essay and have added it in the last section.

I believe that any talk on spirituality and sustainability will only be complete when it is practiced in everyday life. I have therefore added one essay (Chapter 27) at the end of the book on my small experiment on living sustainably in rural Maharashtra. I hope it will inspire the readers to do a similar exercise wherever they live. This essay together with my short biographical note (the last chapter) will hopefully add to the overall theme of the book.

I must thank my wife Nandini Nimbkar for editing the book and Harish Rao and his team at Projects Monitor for designing the cover and getting it printed.

*Anil K Rajvanshi
Phaltan
August 2010*

Preface to the First Edition

I present in this book a possible explanation regarding the nature of human thought. This is a subject which is as old as human beings and as fascinating as life itself. The history of mankind is full of innumerable attempts by philosophers, religious leaders and lately by scientists to explain the nature of the human thought. I hope to add my tiny bit to this endeavor. It is also my fervent hope that this book will stimulate readers' imagination and help the debate on it.

This book has been written with great humility. The nature of human thought has been explored since the humans have existed on this planet and it will be arrogant on my part to claim a solution to this riddle. If what I have shown in this book presents a new angle for looking at it then it will be a small progress towards the final frontier - namely the knowledge of how the mind works.

Theme

Throughout the history of human civilization there have been large number of instances where so called "miracles" have been performed. These have included levitation, production of material things from thin air, physical healing, etc. The nature of these miracles is same, irrespective of religion and different civilizations. Some of their accounts have been exaggerated but a large body of information shows remarkable consistency in their nature and reporting. To my mind these events have come because of interaction of human thought and material surroundings. After all, a thought produced by physical brain has to be physical in nature and hence governed by scientific laws. Thus the curiosity arose about which laws of science operate to make these things happen. This led to the material presented in this book.

I have therefore tried to explain the basic nature of human thought, its production and transmission. Thus a conceptual framework has been attempted to show how deep thought (a

product of intense concentration and meditation), space, time, matter and Universal Consciousness are related. An attempt has been made to explain human thought in the light of modern brain research and cosmology.

The ideas contained in this book have evolved intermittently over a long period and were written in diary form and posted on the web. Most of them are however intuitive in nature and hence not exact in the formal sense. It is my hope that some bright reader will help in providing a rigorous mathematical formulation to some of them.

Most of the time scientists scoff at these conjectural ideas and term them pseudo science. However if in early 1800s somebody had told mankind about Einstein's relativity theory and the space-time continuum, people would have had the same reaction as today's so called hard-core scientists have about mind/matter subjects. The black magic of today is often the science of tomorrow.

The spirit of science encourages our imagination to flower and to conjecture and the only validity of such conjectures is the proof from the experiments. It is my firm belief that we should have an open mind on the subject of mind/matter interaction and try to figure out how it could be possible. When large numbers of people throughout the history of mankind have reported strange phenomena, they were not fools but were simply reporting events about which they did not understand. We owe this much to ourselves to at least make an attempt to understand these phenomena, try to explain them with the present laws of science and in the process even extend the laws of science. Science makes progress only when it helps develop theories which explain the existing experiential facts. To deny the existence of these facts in the mind/matter realm is to rob the science of its jewels and to retard its progress.

There is an interconnection of everything in the Universe. Hence a theory of human thought should be able to explain the interaction of human thought and matter and ultimately the nature of matter itself. I have attempted such an explanation in Chapter 3.

Thinking about the nature of thought is a thought itself and thinking about “ultimate” thought is bliss personified. It is quite possible that with the present brain it may not be possible to perceive the “ultimate reality”. A direct perception or experience is the only mechanism which can do that. That is the highest form of knowledge. Thus what has been presented in this book is a signpost towards the goal of direct experience. Hence it is not a “how to” book but it will hopefully allow readers to think deeply about some of the basic issues.

Organization of the book

I have been writing essays for the last couple of years on various aspects of human thought and its interaction with events of daily life. These essays have appeared as editorial articles in Times of India (Speaking Tree) and in other websites. I have taken the liberty of putting these essays in the book. They have been modified and expanded for better explanation. However there is some overlapping of information in these essays. For the sake of completeness, I have done this so that each essay is self-contained and can be read without the need to look for information from other essays.

I have arranged the essays into three themes. The first section (Basic Theme) contains the essence of the book. The essays in this section describe the science and philosophy of human thought and its interaction with matter; interrelationship of time, space and Universal Consciousness; and the issues of death and reincarnation. These essays are interrelated and hence it is advisable to read them sequentially.

The second section (Deep thought and more) contains short essays on how cultivation of deep thought helps us become spiritual, happier and better human beings. These are stand-alone essays and can be read in any order.

This book is about spirituality. True spirituality helps make us better human beings by giving us depth and long term perspective

in life. Besides it also helps us to put a cap on our greed for resources and hence may help us produce sustainable lifestyles. The last section contains stand-alone essays on spirituality and technology and shows that both go hand in hand to produce a sustainable society. I consider this a novel insight on the issue of development.

Every book, no matter how esoteric or deep the subject may be, is a reflection of the author's perspective and is guided by his/her experiences. It is no different in the present case. I have therefore decided to share with the readers the forces and thoughts that have guided me in this journey. The last chapter describes briefly my personal spiritual experiences.

Data from a large body of literature have been taken and referenced together with detailed notes at the end of the book. I have avoided cluttering the main essays with detailed scientific explanations and the research minded readers will find sufficient material in the notes.

The major source of inspiration for writing this book has been "Patanjali Yoga Darshan"¹. I have been guided by the spirit of sage Patanjali and the more I study his book the more I realize the ocean of knowledge in his writings. The present book can therefore be thought of as an attempt to provide a partial commentary on his sutras.

If the readers are inspired by some sections of this book then I will feel that I have touched the truth, though fleetingly. Search for the state of highest truth is the greatest joy and happiness that human beings can aspire for. That is the whole essence of being human.

Happy reading and thinking!

Anil K Rajvanshi

Phaltan

July 2004

Acknowledgements

Large number of people have read various chapters of the book and offered valuable suggestions. Thanks are due to P. Balaram, C.R. Bhatia, Richard and Masuma Downie, Venkat Kumar, Arun Majumdar, Darcy Meeker, late Meenakshi Mukherjee, Nandini Nimbkar, Noorie Rajvanshi, Madhura Rajvanshi, J. Srinivasan, Prashant Trikannad, Maarten Smit and S.P. Sukhatme.

I would like to thank Narayani Ganesh the Editor of Speaking Tree for publishing some of the essays as editorial articles in Times of India. Similarly thanks to Rajender Krishna who published some essays on his website boloji.com.

Thanks to S.S. Aherrao for typing umpteen drafts of the book diligently and without a murmur. I would also like to thank Harish Rao and his team at Projects Monitor for designing the cover and Sujit Patwardhan and his team at Mudra for printing the book.

I would like to thank B.V. Nimbkar for making it possible for me to come and work in Nimbkar Agricultural Research Institute (NARI) after my return from US in 1981. It is at NARI where most of my work on renewable energy, sustainable development and spirituality has taken place.

This book could not have been written without the love and affection of three women in my life. My wife Nandini Nimbkar who read umpteen drafts and made editorial corrections and my two daughters Noorie and Madhura who often acted as a sounding board to my ideas and were never hesitant to criticize them. Special thanks are also due to Noorie for making the drawings and figures.

Basic Theme



1. Nature of Human Thought

Almost all of us, sometime or the other in our life, have gone through the experience of feeling that somebody is following or watching us. Whether it is a human being or an animal it makes us turn our neck to see what it is and investigate. Similarly there have been innumerable instances where people and animals have sensed danger much before it strikes them. What is the nature of the signal that tells our mind that somebody is watching us or there is a lurking danger and how is that signal generated and sent from the pursuer's brain? In other words what is thought and how is it generated and transmitted?

Since time immemorial mankind has thought, discussed and written about the origin of human thought. The religious writings are basically a discussion on it. Perhaps the greatest treatise on it has been Patanjali's Yoga Darshan, which to my mind is still one of the most definitive and scientific writings on the control of human thought¹. Patanjali's book is the oldest book on Yoga. It is believed that he wrote his book some time in 300 BC or even earlier though there is still dispute about the date. In it Patanjali defines Yoga as control of thought waves. This is probably the first definition of Yoga. He then describes how through Yoga, one can produce concentration and how this concentrated thought can be used to gain physical and spiritual powers for a person's ultimate enlightenment.

This book consists of 195 sutras (Sutra is a Sanskrit word meaning precise maxim) and is divided into four sections¹. Each section consists of about 40-45 sutras. The first two sections give precise instructions on how to control thought through yogic practice. The third section tells how one gains mastery over natural forces through thought control. This section therefore deals with how a Yogi (person who practices Yoga) can acquire superhuman powers of omniscience, telepathy, clairvoyance, mind reading, etc. The last section talks about how with yogic practice and superhuman powers a Yogi can remove the memories of past births and make his or her mind powerful enough to clear

it of extraneous impressions (memories) so that he/she can be liberated from the cycle of birth and death.

Interestingly enough sage Patanjali does not address the central question of how the thought originates and what is the nature of its generation, but gives details on how to control it for achieving mastery over natural forces. However recent developments in brain research make it possible to understand thought, mind and consciousness.

Generally human thought has been considered by philosophers, religious leaders etc. as non-material in nature. However, a result (thought) produced by a physical brain has to be physical in nature and governed by physical laws. I will attempt to throw light on what these laws could be. Most of the concepts presented here are intuitive in nature with very little mathematical formulation.

Scientists have conducted many studies all over the world to find out how the brain works. Magnetic resonance imaging (MRI) techniques, which are non-invasive in nature, are normally used in mapping the brain. Recently scientists have started using functional MRI (fMRI) for sharper images². Thus fMRI scans are taken of the brain under different stimuli which show up on the computer screen as maps of blood flow in the brain. Scientists then say that the place of maximum blood flow is the area where thought of a particular nature is generated. They also say that memory of that particular stimulus exists in that part of the brain. However, we are still not sure what the exact location of memory is and there are conflicting theories about whether fMRI really shows all the neuron activities for a particular thought. Besides fMRI may also interfere in the thought process since it produces magnetic field, which is tens of thousands of times stronger than the earth's magnetic field.

Nevertheless there is a consensus that a thought is produced when the brain neurons fire. How many neurons fire for a single thought nobody knows. We can however conceptualize that firing of neurons produces a **structure like a hologram** which can be

called a thought. We will try to explain the nature of this structure and its attributes in the following sections and chapters.

There are close to 100 billion neurons in the brain (the exact number is unknown)³. Neurons are special cells found in the nervous system of all animals. Each neuron may have thousands of branches called dendrites and axons which connect it to other neurons and thus there could be a minimum of 10^{14} units (100 billion X 1000) taking part in the neural activity. Recent scientific evidence suggests that besides neurons another type of cells called glial cells also take part in communication. Glial cells outnumber neurons by nine to one and can modify the signals transmitted by each neuron³. Thus the number of different combinations for communication and memory production are mind-boggling.

Most of the time a fraction of these neurons fire for "mundane" or every day thoughts such as; what is the color of a shirt, open the door etc. etc. However, for a very deep thought, in which a person may be concentrating on a single subject for a long time, it is quite possible that the whole brain is active and thus close to 100 billion neurons are firing to produce that single thought. The number of neurons firing may also decide how long the brain focuses on a single thought and on its intensity. A deep thought in which a person contemplates and reflects on a particular object very intensely and almost goes into a trance-like state is called "*Sanyam*" in Patanjali Yoga Darshan. Practice of *Sanyam* also helps in developing a powerful mind.

According to Patanjali the whole basis of Yoga is to achieve *Sanyam* and its use on any object results in its complete knowledge⁴. Interestingly sage Patanjali devotes one fourth of his book on how the deep thought can interact with matter and produce wonderful physical powers for the Yogi. To my mind he is the final word on the control of deep thought and its use to discover God or Universal Consciousness. I will therefore focus on the structure of deep thought and its production and will point out at appropriate places how this structure and its attributes tally with what Patanjali has written.

In order to explain thought, which is a hologram or a geometric structure, we will take help of the concepts of energy-based dissipative structures, chaos theory and synchronization or emergence of spontaneous order. All these concepts show how order is produced from chaos, especially when a large number of variables interact with each other. This interaction produces a geometric structure from seemingly chaotic behavior of these variables.

Dissipative Structures

The concept of dissipative structures was developed in the early 1970s by Nobel Laureate Ilya Prigogine⁵. These are energy-based structures and their shape and size depends on the quality and quantity of energy supplied to the system. For example, if water is heated in a utensil from below, then according to classical thermodynamics the heat energy will produce random motion of the water molecules and this process will continue till the “heat death” of water (total evaporation of water) takes place. In actuality, at a certain temperature and amount of energy input, convection sets in (Fig. 1c). These convection currents (also called Benard cells⁶) form energy structures which are geometric in nature and take the heat from below and dissipate it above to the surface of water. Hence the name dissipative structures.

These structures are developed in systems which are far from equilibrium and hence are very chaotic, and materialize suddenly when critical conditions are reached. The far from equilibrium condition takes place only when huge amount of information gets embedded in the system⁷. The dissipative structures are therefore like crystallization of information and this concept has been used to explain the evolution of cities, organizations, societies, etc.⁵

One can extend this analogy further and can think of Christ, Buddha, Einstein etc. as such structures, which appear when conditions in the world are favorable (i.e. “chaotic”).

Chaos Theory

Chaos is a characteristic of dynamic systems and was defined by Edward N. Lorenz, the father of modern chaos theory⁷, as a process that appears to proceed according to chance and hence is random even though its behavior is in fact determined by precise laws. For example, in the convection of water heated from below, if we sit on a single molecule or a cluster of molecules of water and chart its course as it goes from bottom to top and then comes back down, then we will see the picture as shown in Fig. 1(a). The water molecule is hit by other energetic water molecules and thus its motion is zigzag and very random. If we superimpose this picture on that for the next cycle then it will be like Fig. 1(b). If we do this thousand and millions of times then we develop a structure (or a band) in which the water flows from bottom to top as seen in Fig. 1(c). These are the convection cells or the dissipative structures.

Thus the random motion of these molecules evolves into a structure or convection current where majority of molecules flow

Fig. 1(a)

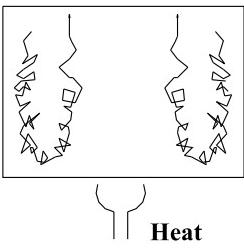


Fig. 1(b)

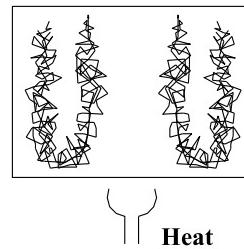
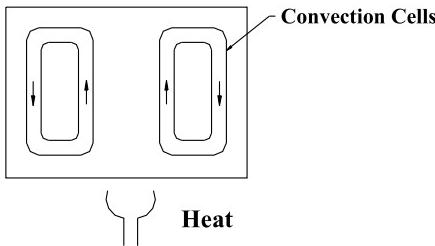


Fig. 1(c)



through this band and seems as if they are “attracted” to it. In chaos theory these bands are called as “attractors”.

With increase in heating, which results in temperature rise (and ultimately the water comes to a boil), this structure changes shape and hence the water goes up more vigorously and with greater speed. Thus the structure is geometric, energy-dependent and dissipative in nature (dissipates heat) and is a function of the quality and quantity of energy input to it. The seemingly chaotically moving water molecules now have a definite path (convection pattern) in which they move.

Both chaos theory and Prigogine’s dissipative structures have similar characteristics. They both show that in systems which are far from equilibrium and very chaotic, structures appear suddenly. These structures in the case of water are in four dimensions (three of space and one of time). However, for a very large number of variables like a billion neurons firing in brain to produce thought, they could be in any number of dimensions greater than or equal to four. This idea is discussed in greater details in next chapter.

Thought as a Synchronized Geometric Structure

We can consider thought as a dissipative structure or an “attractor”. It is produced by the firing of a large number of neurons. How does such firing produce a structure called thought? Emerging science of synchronization might help to explain it⁸. This field emerged when it became possible to explain successfully how a very large number of fireflies start glowing in a synchronous manner in a short time after their random initial firing. Thus synchronization of fireflies glowing, heart cells beating (pace maker) etc. are all outcome of a spontaneous order by which a large number of similar objects or oscillators work or fire in unison.

These oscillators synchronize spontaneously since they are influenced by each other via a positive feedback-type mechanism – in case of fireflies through their light signals. This feedback allows the oscillators to adjust their phases so that they synchronize. Such synchronization can explain the emergence of a geometric

structure called thought when a large number of neurons fire from a certain portion of the brain. The neurons communicate with each other via feedback loops (through chemical signals) and even photonically (via light). This latter possibility exists since firing of neurons produces very weak light signal which may help in thought synchronization. As one thought emerges and subsides (if not enough energy is provided to it), it is replaced by another thought emerging from another part of the brain and in this way the brain chatter takes place!

I conjecture that this thought structure is a hologram and probably could be the reason why most of our thinking is geometric in nature and we seem to visualize everything in terms of shapes and geometry.

The emergence of thought is a function of signals from sense organs or stimulation of certain memory space in the brain. However, an entity called 'I' (ego, will, sense of identity, etc.) acts like a symphony director and helps provide the necessary energy to maintain a given thought for a longer time. Besides it also provides coherence to random thoughts emanating from different parts of the brain. We still do not understand how 'I' can influence this process, but just like the music conductor who determines which part of the orchestra plays for how long, 'I' decides how long a particular thought will remain in the "vision" field. This process called concentration seems to also exist in animals.

With practice, concentration becomes stronger till a person can make nearly all the 100 billion neurons fire in a laser-like fashion for a long time on a single thought. This is the genesis of meditation or *Samadhi* and with practice the deep thought hologram can be made so intense that it can **transform suddenly from 4 - dimensional space to higher dimensions and may reside there as memory**. We will discuss in detail how this happens in Chapter 2.

The ability to concentrate and to keep a single thought on a subject in the "vision" field for a long time is however unique to human beings because of our huge brain and memory size and is also governed by the will of a person. Yogis claim that will power

is increased by continence. Recent scientific evidence suggests that the brain is full of sexual chemicals and their increased concentration in it helps in memory enhancement⁹. As memory increases so does the ability of concentration. Thus the desire to save these chemicals could be the basis of celibacy preached in almost all religions.

Concentration and will are related. With stronger will the concentration increases since we can force ourselves to focus on a single thought. Similarly as the concentration increases with practice a person gains stronger will power since 'I' gets strengthened.

Besides concentration, deep thought production could also be helped by drugs and application of electromagnetic (EM) fields to certain areas of the brain^{10,11}. Patanjali states that besides yoga, paranormal powers can also be obtained by the use of drugs¹². The drugs according to him help in concentration and hence in production of *Sanyam* and ultimately in getting powers. Hence ancient Indian Yogis knew the nature of brain and the effect of chemicals on thought. There are also innumerable examples of mind-altering drugs like LSD etc. which have created altered states of consciousness (including out of body experience) and have given powers of clairvoyance to the user as long as their effects last¹³.

Recently it has been discovered that sending a very weak current to the back of the right side of the brain triggered an out of body experience (OBE) for the patient¹⁴. This OBE could be produced at will whenever a particular part of the brain was stimulated by an electric current. OBE is one of the major outcomes of Yoga and is mentioned in the *vibhuti* (powers) section of Patanjali Yoga Darshan¹⁵. Naturally a yogi has to practice years of *tapasya* (spiritual practice) before he or she can achieve the OBE and sense of levitation. However technology seems to allow this pleasurable experience quite easily! For example altered states of consciousness in subjects have been induced by use of high-powered magnetic fields at different sites of the brain. This transcranial magnetic stimulation (TMS) is non-invasive and can be switched on/off at will¹¹.

Nevertheless both the chemical and EM techniques to enhance deep thought may produce short-term effects and may not be replicable. Besides the use of chemicals and drugs can produce dangerous side effects and may cause irreparable damage to the brain. Thus the surest method of producing replicable *Sanyam* is by sustained and willful practice of meditation and yoga. There is no shortcut to happiness!

Once the mind cultivates the habit of focusing on a particular thought for a long time, then the neural pathways for other thoughts sublimate and regroup to provide energy for this single thought. Because of the formation of new neural pathways, it is quite possible that earlier memory (Patanjali calls it *Sanskars*)¹⁶ can be dissolved and new memories can be formed. This is because a concentrated thought which is made stable for a long time requires more energy and neurons to sustain it and can only happen when the old memories are dissolved to free these neurons. Recent scientific evidence also suggests that the adult human brain is pliable and capable of creating new neural pathways and connections¹⁷. Removal of past memory by Yoga is a mechanism for liberation (from cycle of birth and death) or *Kaivalya* and is a central theme in Patanjali Yoga Darshan.

Some yoga methods nevertheless preach suppression of thoughts as a mechanism for removing memory. I feel these methods can never provide enough energy to break the existing neural pathways. Thus the suppressed memories always remain and sometimes come out with vengeance just like steam release from a pressure cooker. This is normally the case with suppression of sexual thoughts as preached by practitioners of this system. Thus the only way to remove the memory is via Yoga and *Sanyam*.

Use of deep thought on various subjects has produced the greatest discoveries of this planet. Einstein's relativity theory, Newton's gravitation theory and the truth revelations of Yogis and great spiritual leaders have all come because of their tremendous concentration and deep thought on their subject. It is a common utterance among scientists and lay persons that one particular person thought so deeply about a particular problem that Nature

revealed her secrets to him. This *Sanyam* done on any particular idea or object leads to its complete knowledge or mastery over it. How deep thought produces knowledge is dealt in Chapter 2.

Deep thought also brings great joy and happiness to a person. The exhilaration that one feels in getting deep knowledge, creating new inventions or discoveries, is beyond any experience obtained through other human endeavors. Deep thought may help stimulate the pituitary gland and produce a sense of happiness. Our brains are somehow wired in such a way that we get a sense of well being when in deep thought. Maybe a union with the truth, super consciousness or God via deep thought is inbuilt in our system¹⁸. Hence understanding the structure of deep thought and its attributes can help mankind progress towards fulfillment and happiness.

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2. Deep Thought in Higher Dimensional Space

As we conjectured in Chapter 1, deep thought is a stable structure and may exist in a higher dimensional space-time fabric. We still do not know the nature of this space, but will try to create a general picture of what its attributes could be.

Our world that we see and feel is four-dimensional (three dimensions of space and one of time). However, theoretical physicists have recently suggested that there could be 10 dimensions of space and one of time to make our universe 11-dimensional¹⁹. Cosmologists and physicists invoke these extra seven dimensions in order to relate electromagnetic, nuclear and other forces with the all-pervasive gravity field. Unfortunately we cannot see these higher dimensions but at best can conceptualize them through higher mathematics. According to the presently accepted theories our present universe has only 4% ordinary matter and the rest 96% consists of “dark matter” and “dark energy” which we cannot see and know very little about. It is quite possible that this energy and matter might exist in higher dimensional space²⁰.

According to Indian philosophy Universal Consciousness is even more ancient than time and gravity. If we follow this line of thinking then it is quite possible that our universe may be multi-dimensional and substantial part of it exists in higher dimensions. It is also possible that the four-dimensional space-time continuum, which we can visualize and feel, could be a “crystallization” or “shadow” of multi-dimensional reality.

The concept of higher dimensional reality has been mentioned and alluded to in many spiritual books of India. For example in *Bhagwat Gita* (one of the holiest books of India) Arjun the warrior was shown Lord Krishna’s “*Virat*” form (*Virat* means huge) or the birth of cosmos²¹. The description of “*Virat*” form is very similar to that of destruction of matter by a black hole! However for Arjun to see this form Lord Krishna gave him a divine vision since with

the existing vision it was not possible to show him the multi-dimensional reality. Similarly it might not be possible for us to see the higher dimensions till we leave the present four-dimensional world.

An interesting aspect of higher dimensional reality could be that a being residing in it will be able to predict events of our four dimensional world since he/she will have a "better view"^{19(b)}. Some yogis get this power of "seeing" multi dimensional reality or clairvoyance through *Sanyam*.

The four-dimensional space-time continuum is slightly flexible and thus it can be bent by massive bodies. This is the consequence of geometric nature of gravity. The bending of this continuum results in deflection of light when it passes near these bodies. Einstein predicted this bending of light in his famous paper on General Theory of Relativity published in 1915. This prediction was confirmed experimentally in 1919 by the British physicist Arthur Eddington when he showed that the light from a distant star bent as it passed the sun during the total solar eclipse²². As the space dimensions increase and become greater than three, it is possible that the rigidity of space also increases and it is this rigidity that we are interested in looking at for our deep thought.

One aspect of this rigid space is that the loss of information from a signal is very little. In the existing four-dimensional space-

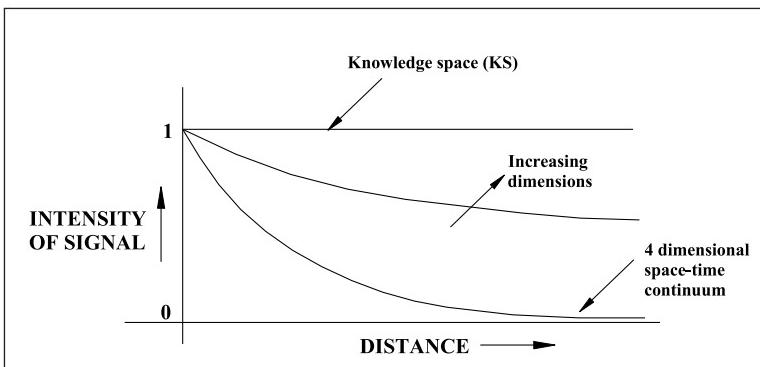


Fig. 2. Rigidity of Space

time world the attenuation of signal is via $1/d^2$ law i.e. the signal strength reduces from the source by inverse of distance squared²³. As the space dimensions increase and the space gets rigid the signal attenuation reduces and may follow the path as shown in Fig. 2. With increasing rigidity the velocity of signal in that space also increases and in higher dimensions it could be many times the velocity of light.

Knowledge Space

Since the signal loss is reduced drastically in higher dimensions, it is possible that **this space may contain structures or memories**, which are very stable, and thus an information or knowledge structure will remain there forever. I think a deep thought structure, which is geometric in nature, occupies this space. We can call this space as **knowledge space (KS)** (Fig. 2) and it may contain fundamental knowledge produced in the past and is continuously fed by the ever-increasing knowledge from various civilizations. A prepared and focussed human mind can access knowledge from this space and I feel that great discoveries of mankind have come from such access.

It is possible that KS, which is filled with memories of very deep thought, may include intense emotions, fundamental discoveries which come out of very intense and sustained thinking and templates of various life forms. The memories of life forms remain because these forms existed for a very long time (couple of million years). Thus either a deep thought for a long time or “nearly constant” life forms for a long time produce these stable memories in KS. It is as if the continuous stretching of the space-time fabric by these forms creates memories in KS. Even if the physical form disintegrates the ghost or memories remain in KS. This memory of forms maybe the basis (besides the regular evolutionary forces) of new life forms for a very young life-sustaining planet.

It is also possible that as earth moves around the sun and the solar system revolves around the center of the Milky Way galaxy, periodically we come across KS, which helps mankind and other

life forms to evolve²⁴. Similarly a younger civilization than ours may come across KS developed by us and thus the evolution continues. Since KS exists in higher dimensional space and is not a part of earth space system, it will not be dragged with earth as it moves round the sun and the galaxy. Thus it remains fixed in space and can be accessed by a great mind whenever it comes in its vicinity.

The movement of earth and the sun around the Milky Way galaxy is time-dependent (it takes about 226 million years for the solar system to make one round of the Milky Way galaxy) and so is earth's encounter with KS. Thus our discoveries are time-dependent and not person-dependent. Any prepared mind encountering the KS at a particular time can get that knowledge. There are many instances in the history of mankind when quite a number of people had similar ideas and thoughts at about the same time. Prepared minds encountering KS react in the same manner.

Interestingly this also raises the possibility that there may be knowledge cycles, since the movement of earth in space is cyclic. We are not sure what may be the period of such cycles, but in ancient texts there are references that it may be anywhere from few hundred to tens of thousands of years. Periodic appearance of great souls simultaneously on this planet earth may be an outcome of these cycles²⁵.

However not all knowledge in the KS is positive. Intense thoughts and emotions like lust, hatred, jealousy, pain, etc., are also a product of intense concentration for a reasonably long time and hence may reside in KS. As some of these structures are very much related to an individual, they may come to haunt him/her during various reincarnations and maybe the genesis of karma that the Indian Philosophy talks about.

Thought-engine and Production of Matter

The transformation of one space-dimension into another can take place via a "thought-engine". This is similar to a reversible heat-engine, where energy flows from higher temperature (source) to

lower temperature (sink) and in doing so the engine produces work²⁶. Similarly, in the “thought-engine” when a certain dimensional space transforms into a lower-dimensional space, energy or mass comes out. Similarly by application of energy and mass, a lower-dimensional space can be transformed into a higher one. The transformation from one space-dimension to other is via a quantum jump and hence is not a continuous transition²⁷. This is almost like creation of new structures via the chaos theory mechanism as discussed in the previous chapter. Fig. 3 shows a concept of thought-engine.

If we take this analogy further, then we can conjecture that at the highest space dimensional transformation, even the **time gets sucked in and only space remains**. This is a novel concept showing that time can be introduced and removed from the universe and hence the **total time in universe is constant**. We will talk in detail about it in the chapter on Time. Maybe the final dimension (which we can call ‘G’) is GOD. Probably it is ‘Akash’ (Sanskrit word for space) or the final entity as discussed by the ancient Indian philosopher Adi Shankaracharya in his famous book Vivekachudamani²⁸.

This ‘G’ space has always existed with no past, present or future. Since time is used (sucked in) for transforming lower dimensions into ultimate ‘G’ dimensional space, it is equivalent to energy and since it devolves into ultimate space, it may also have geometric properties. Thus it is possible that **TIME, ENERGY,**

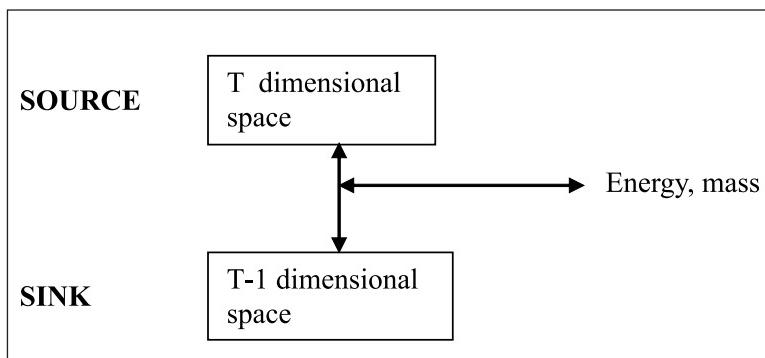


Fig. 3. Concept of a reversible “Thought-engine”

SPACE are all related. Since time is the last thing to devolve, it is possible that our present world may have **time dimensions**. We are not sure what those dimensions are.

Thought-engine also provides a possibility of annihilation and production of matter. This could be a mechanism by which some Yogis claim to produce material from thin air and could explain the poltergeist phenomenon!²⁹ It also opens up a possibility of form-templates or memories existing in higher dimensional space being transformed into matter and hence creation of completely new designs and inventions. Presently this process normally takes place when great inventors tune into KS and then use that knowledge to create new and revolutionary designs.

Similarly thought-engine also provides a mechanism by which personal consciousness is connected to Universal Consciousness since we can reach space 'G' through deep thought. Thus deep thought, matter, space, time and Universal Consciousness are all related. With this relationship it may be possible to find out how we can get Universal knowledge.

Gaining Knowledge via Thought Packets

There are two types of knowledge – one is incremental and the other is a quantum jump in our understanding of the world and its working. An example of the former is the incremental improvement in chip-making process. A large army of workers all over the world is working step by step in improving the efficiency of this process, so that an increasingly larger number of chips could be put in a small space. Production of a silicon-based transistor by Shockley and his team in early 1950s at the Bell Labs in U.S.A. was an example of quantum jump in knowledge³⁰. It allowed mankind to move away from vacuum tube-based diodes to solid state electronics and ushered in the modern computer age. Similarly Einstein's theory of relativity, Darwin's evolutionary theory or Newton's theory of gravitation are other examples of quantum jump in our understanding of how our universe is structured. Such quantum jumps in knowledge in any field,

whether spiritual, technological or scientific help in mankind's evolution and give a direction and purpose to it.

The higher-dimensional thought analysis together with Patanjali Yoga may help us understand how the "quantum jump" knowledge is perceived by prepared minds.

With tremendous focus and concentration, the prepared mind produces a large number of possible solutions to a problem being explored. This churning of information stored in the brain creates a template of information, which is checked continuously with the object of perception. With *Sanyam*, the mind is able to focus on a particular thought for a very long time till the continuously modified template eventually matches the object in a lock and key-type interaction leading to knowledge. This template or thought packet actively interacts with the object of perception via higher dimensional space and can perceive any knowledge in the universe. Patanjali alludes to this process in his *Yoga Darshan* when he says "Just as the pure crystal takes the color from the object, so does the mind stilled of thought waves identifies completely with the object of concentration".^{32(a)}

Some Yogis have claimed that they can see packets of thoughts as they come to them from external sources. This could be the basis of mind reading capabilities possessed by them. A powerful brain can therefore become a very powerful processor and hence can extract useful information from weakest of thought packets. Similarly there are claims by some mediums that they can tell the history of a person by touching and contemplating on some of the physical objects associated with him/her²⁹. Sometimes these techniques have been employed in solving difficult murder cases. It seems that the template of the object together with the strong emotional memories attached to it may exist in higher dimensional space and with deep thought the medium is able to extract that information.

Thinking deeply is a two-way street. We can send thought packets as well as receive them whenever our minds are anchored to the object of perception. In fact the very act of perception means that the information packets will be received from the object of

perception. The same applies to thinking about somebody. Hence one should not think negatively about others even if they have harmed us because the very act of thinking about a negative person brings his/her negativity to our mind.

It can also be conjectured that as our minds are the products of the same time frame as the Universe, we cannot think beyond what already exists in it. At best we can discover the already existing truths. Thus our discoveries and the products of our wildest dreams and imaginations could be the outcome of knowledge and templates which exist in KS somewhere in the Universe. A powerful mind via the thought-engine can help us to discover it.

Also from the “thought-engine” concept we have seen that in reaching the GOD or ‘G’ space even the mind gets sucked in. Thus **theoretically it is not possible to understand the final entity since the process (thinking) and the instrument of perception (the brain) will not exist.** This has profound implications that **under no circumstances can we get the theory of everything** that the physicists and other scientists are desperately searching for!

Sensing Thought Signals

There are innumerable recorded instances where ordinary people have been able to sense danger or suddenly get a feeling about their loved ones from quite a distance away²⁹. We normally call it sixth sense. This could be a mechanism by which intense thought packets concerning the particular person are received by his/her brain which then processes them in a lock and key type arrangement to get the necessary information. Somehow it seems the brain is hardwired more favorably for receiving strong emotional signals from the loved ones.

Sometimes the sensing of danger signals also makes the hair on the neck stand up. Many people especially big game hunters have reported this as a sign of imminent danger. Similarly standing up of body hair or getting goose pimples happen when one feels powerful emotions²¹. This reaction to danger is also manifested in most animals. Sociobiologists give an explanation that all animals

do this to puff up so that they can increase their size and scare the pursuer. I however feel that **hairs act as antenna** for danger signal so that the body's sensitivity to it is increased. This enhanced signal via the body's surface helps the brain to react rapidly and before the manifestation of actual event.

A powerful brain can also become very sensitive to outside signals. Such a sensitive brain can identify itself with any idea or object in the world. For example, once Shri Ramkrishna - a famous Indian saint, while in a heightened state of awareness, identified himself with the grass in the lawn in front of his room and felt a tremendous pain in his chest when he saw somebody walking on the grass³¹.

Similarly a powerful brain becomes acutely aware of its surroundings and starts interacting with the forces surrounding it. I therefore feel that human thought may interact with gravity – the most powerful force in the universe. We will discuss about this interaction in next chapter.

It is also possible that when we get profound knowledge then it affects the body since energy is released during the transformation of higher dimensional thought to that of lower dimensions. It has been known throughout the history of mankind that people who possessed great knowledge like Yogis or spiritual and intellectual leaders had an aura, radiance or personality around them. It seems the energy release via thought-engine helps in aura production. Patanjali alludes to this concept in his book when he says that as a Yogi progresses on his path to knowledge the body gets beauty, grace and strength with the hardness of thunderbolt³². This change in body and personality positively affects people who come in contact with the enlightened soul and has a positive cascading effect. Thus the personal evolution towards enlightenment is the best way to transform the world rather than imposing our arrogance and will on a large number of people.

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3. Deep Thought, Matter and Gravity

We have conjectured in earlier chapters that deep thought is geometric in nature. So is gravity and hence it is possible that they may be related. Thus deep thought may bend the space-time continuum similar to that done by gravitational mass³³. This interaction might take place in higher dimensional space. Also as mass could be produced and annihilated via a thought-engine during transformation of spaces, it is possible that deep thought and gravity maybe related at a deeper level.

There is a large body of psychokinesis data from all over the world attesting to the interaction of mind and matter²⁹. Thus production of materials from thin air, changes in materials by application of thought only, levitation etc. have been reported by people throughout the ages and from all different civilizations. Patanjali Yoga Darshan states that with *Sanyam* on various objects, a Yogi gets power to master nature so that he can fly, become invisible, move objects by thought and make the human body a very powerful instrument for knowledge gain³⁴. All these things can take place only when deep thought and matter are interrelated and hence can interact.

Deep thought is a product of almost 100 billion neurons firing in a laser-like fashion. Similarly it may be possible that gravity manifests only when a very large number of particles are involved. Both gravity and deep thought therefore involve large-number mathematics. The exact nature of how it takes place is not known. We can only measure gravity with masses of the order of milligrams. According to physicists below this mass it is extremely difficult to measure gravity since gravitational forces are very weak. Nevertheless even a milligram of substance contains billions and billions of atoms and it is possible that these large numbers produce (possibly through the movement of electrons and atoms, etc.) a signature called gravity. This concept is very conjectural in nature. However, it is quite possible

that movement produces the necessary structure which could be either thought (firing of neurons) or gravity (movement of electrons etc.). **Movement is an outcome of time.** Without time there is no movement and ultimately everything devolves into 'G' space.

There are many instances in Indian Yogic tradition where highly evolved Yogis and enlightened individuals have left their body with full knowledge of conjunction of planets and stars. Thus in Mahabharata (an Indian epic) it is mentioned that Bhishma Pitamah stayed on the prickly arrow cot for six months before he left his body during "*Uttarayan*" (Sanskrit word for sun rising from north) when the sun was closest to earth in winter³⁵. Similarly Vivekanand and Shri Ramkrishna - two great Yogis of India in the 19th Century left their bodies by will, after detailed understanding of planets' conjunction through the almanac³⁶. In ancient Indian text of Brahma Sutra, it is stated that the soul guided by Sun's gravity reaches a space called heaven³⁷. Apparently the ancients knew about the effect of gravity on soul and deep thought.

Gravity Antennas

That the ancients knew about the effect of gravity on human soul is also attested to by the superstructures built for kings and queens burials. It can therefore be conjectured that the Egyptians built the massive pyramids as gravity antennas for passage of soul. The biggest Giza pyramid is estimated to weigh 6 million tons and the King's and Queen's burial chambers are close to and equidistant from the center of gravity of the pyramid³⁸. It is quite possible that the ancient Egyptians understood that localized gravity might help the passage of soul through intergalactic space. Alternatively it is also possible that a pyramid might act as an antenna for deep thought or Universal Consciousness to help resurrect the King and the Queen! I feel the same laws may have been used by the Yogis when they meditated inside deep caves in mountains. The mountains could have acted as antennas for reception of universal knowledge.

At another level, the earth's gravitational field might have helped in evolution of life on this planet. The molecules of a certain size became "living" when they **resonated with the gravitational field of the earth**. Since movement is an outcome of time, it is quite possible that at this juncture the concept of time also got embedded in the "living" systems. These could be the "critical size" molecules, which were essential for evolution of life. We do not know what this critical size was but these molecules effectively became **gravity antennas**.

In nature all the forces acting on a living entity help in its evolution. Gravity forces are the largest force acting on any organism on this planet earth. Hence it is natural and quite possible that gravity helped in life's evolution. It may be interesting to test this hypothesis by taking the "critical size" molecules to the zero gravity environment of outer space and to see whether they replicate and transfer the genetic information—the basic prerequisite of life.

Alpha Waves

The interaction of deep thought and gravity can also be seen in the interaction of alpha waves with earth. Alpha waves are produced in the brain when we are in meditation or relaxing. These waves are generally in the range of 8-12 Hz frequency³⁹. The earth diameter (~12,800 km) is such that it can have a standing half-wave of 11.7 Hz (very close to 12 Hz). Is it therefore possible that our brain evolved in such a manner that the **earth's geometry influenced the alpha wave production?** Incidentally scientists have also discovered that before major earthquakes an electromagnetic wave of 0.01-10 Hz comes from deep inside the earth⁴⁰. This wave is sometimes sensed by animals and could be the basis of reported earthquake prediction by them. In some other habitable planet the living beings may have different alpha waves depending on the geometric shape and size of that planet. **Similarly life on other planets may evolve according to their gravity fields** besides the effect of other environmental variables.

Interestingly enough the relationship between alpha waves and earth's geometry may have other implications. Practitioners of *Bhakti Yoga* (devotional yoga) and Buddhist traditions have always stressed the need to allow full flow of thought waves without any interference from ego or sense of identity 'I' for achieving samadhi. *Bhakti Yoga* says that one should completely sublimate the ego 'I' by abandoning oneself to God or Universal Consciousness⁴¹. Similarly Buddhist lamas of Tibet suggest that one should try to relax so that the ego stops interfering in thought production. I feel both these practitioners are intuitively trying to allow the mind to follow the alpha wave pattern. Thus when mind gets tuned to the gravitational field of the earth, meditation and samadhi results.

Besides gravity, earth's magnetic field may also affect the thought process. A human brain produces a small electromagnetic field. The measurement of this field by EEG shows the activity levels of the brain; whether it is producing alpha or other waves. Any weak or powerful magnetic field may therefore affect its working and hence the thought. Our present age is an electric age and thus we cannot help being engulfed in electromagnetic (EM) fields. Whether they are from our cell phones, or overhead high voltage wires, or microwave ovens, or MRI scans, etc., we are continuously bombarded by them and cannot escape them. These man-made fields together with the fluctuations in earth's magnetic fields created by solar storms provide a very large number of possibilities of affecting the human thought process.

Also both gravitational and magnetic fields of the earth, world over, vary slightly from their mean values. Since they can affect the working of the brain, it is possible that some places maybe more conducive to creating deep thought and creativity. In ancient times this could have been one of the bases of site selection for setting up temples and holy places around the world.

Our present science is based on reductionist principles. We believe that once we find the basic building block then we can construct the whole universe around it. Thus the physicists all over the world are building bigger and bigger atom smashing

machines to smash the matter and discover that ever elusive building block. I feel we are looking at the wrong end of spectrum. Interaction of large number of variables producing their unique signatures may provide a mechanism to link all the various forces of nature. Hence our thesis of deep thought and its relationship with time, mass, space, Universal Consciousness and knowledge maybe a step in the right direction.

In the annals of human civilization, quantum jumps in our understanding and knowledge have taken place when a great thought has been produced by persons like Buddha, Christ, Kepler, Newton, Einstein, etc. It is quite possible that a similar quantum jump may take place when a relationship is discovered between human thought, consciousness and matter. It might help explain two of the major mysteries of our times – consciousness and gravity.

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4. Time and Universal Consciousness

Time is a strange thing. It is everywhere and is always running and always goes in one direction - forward. All living entities have a concept of time. In fact one of the attributes of consciousness is awareness of time. According to Einstein's theory of relativity time can start slowing down at very high speeds or can stand still at the speed of light²². But it can never vanish.

Imagine that time can be removed from and introduced into the universe. In that case the total time in the universe will be constant. This sounds weird but we discussed this concept briefly in Chapter 2.

Our journey starts with higher dimensional space. The world that we see both with our eyes open and closed (in dreams) is made up of four-dimensional space-time. This world is experienced by our senses and is the only world we can feel, smell, taste, hear and touch. However there are other dimensional worlds we can visualise and comprehend through higher mathematics.

A deep thought which is a product of 100 billion neurons firing with laser like action, if held for a long time, can occupy a higher dimensional space via the thought-engine (Chapter 2). Similarly mundane thoughts which do not use so many neurons also produce a structure called thought but it exists only in four-dimensional space and its energy is attenuated according to well known inverse distance law ($1/d^2$).²³ Higher dimensional thought however can go to large distances without attenuation since higher dimensional space is "rigid".

Because of the rigidity of this space it can also have memory and we called it knowledge space (KS). **Thus memory and space are geometric in nature and are related.**

Since lower dimensional spaces can be transformed to higher dimensions via the thought engine we can think of highest space to be G-dimensional, G being an arbitrary number higher than four. We conjecture that in reaching this G space even time

is absorbed. Time is thus the last thing to be sucked in. By the principle of equivalence, it is also the first thing to come out when G-dimensional space converts into lower dimensional space, G-1. The G-dimensional space is the final destination in the universe to which everything ultimately converts. Probably it is God. This is what Adi Shankaracharya has described in his book *Vivekachudamani* where he calls the ultimate reality as *Akash* (Sanskrit word for space)²⁸.

This concept has an interesting implication: Time, space, memory and energy are interchangeable and have similar characteristics, which may be **geometric in nature**. This is the only way in which time can evolve from and devolve into space. This also means that since the total time of the universe is constant, there was never a singular big bang. Instead, there must have been a large number of big bangs and a continuous transformation of G space into four-dimensional space takes place. Many universes are being formed continuously and there are many continuously evolving and dissolving universes. We still do not know how long it takes to complete one cycle or when it starts.^{19(b)} Similarly scientists tell us that our universe is expanding. However it is quite possible that this expansion we perceive today could be an illusion since the signal we receive on earth could be distorted by intervening higher dimensional space.

A similar type of analysis is given by brane theory physicists²⁰. According to this theory our universe exists in the form of a membrane (hence, “brane theory”) and there are parallel universes in other membranes very close to ours. These universes are not visible to us since we only live on our membrane, but when they collide with our membrane, the collision is like a big bang. Scientists suggest that these collisions are taking place continuously.

Since time remains nearly till the end (the last thing to be removed before G space is formed), it is possible that the **universe has the dimensions of time**. We are not sure what those dimensions are. Also, as time is the last thing to be absorbed, **it is theoretically not possible to go back in time**. It is also

possible that each universe may have its own time and physical laws different than ours. Thus it will be interesting to speculate about the boundary and interaction of two universes when they collide.

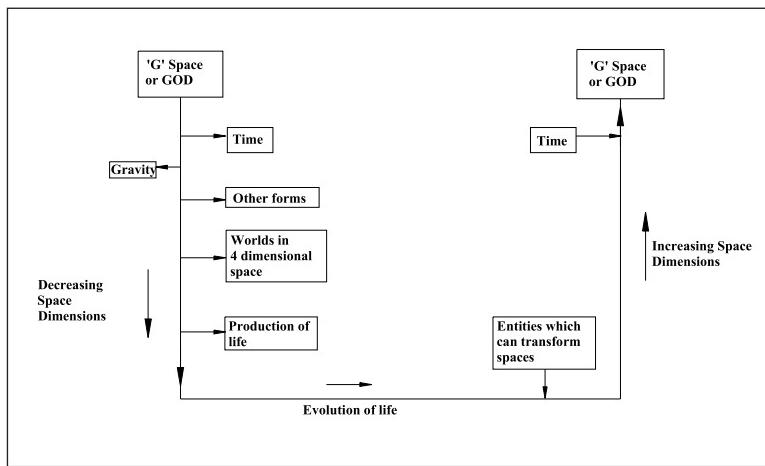
Time and Evolution

I hypothesise that the G-dimensional space starts “becoming” when time comes out¹⁰³. Devolution of G to G-1 space releases time and then the regular evolutionary process starts. **It seems therefore that time is life and life is time.** The evolutionary process continues with life forms merging and evolving to highly intelligent life, till all the entities again reach G space. The cycle continues as shown in the figure below.

Why does God or ultimate space go through the journey starting from the humblest of living systems and proceeds to evolve into a highly thinking human brain? **It is because movement and “becoming” is the only way in which consciousness can exist.** A system in which nothing is happening is a dead system. The ultimate space, G, can only “feel” and enjoy itself through living systems and thus wants to maximise the number of living bodies. This happens only when time comes out of space ‘G’.

Just like rainwater starts its journey through a very large number of small tributaries and goes through rivers and ultimately to an ocean, the ultimate G space may go through innumerable life forms and may evolve through humans and other more evolved forms. This follows the thermodynamics laws in which the system tries to maximise the flow of energy and materials through it with minimum of resistance. The space G minimizes this resistance by going through billions of life forms. These life forms evolve till they obtain ultimate knowledge. Then closure of space takes place and the cycle continues.

Thus evolution and extinction of lower species is normal. It is also possible that this cycle may have fixed time and hence the evolution of mankind towards greater technological and spiritual sophistication is deterministic.



The scenario I have described connects to the Indian yogic system's concept of duality. I feel duality takes place only when time comes out since "Ultimate reality" (space G, Universal Consciousness, etc.) is non-dual. According to ancient Indian scriptures like Brahma Sutra and Upanishads etc. duality consists of *Purusha* and *Prakriti*, or *Pran* and *Akash*⁴² and the combination or interaction of elements in the pairs produce different worlds. This interaction could be possible via the thought-engine. In the final analysis when time itself is sucked in, only the G space or non-dual "ultimate reality" remains.

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5. Art and Science of Happiness

All of us aspire to have a good life and happiness. There are as many definitions of happiness as there are people. But generally people want a decent place to live, mobility, good education for their children, clean environment, a challenging workplace, good and wholesome entertainment and enough money to meet their usual daily requirements. These are the issues around which the modern industrial societies have evolved and yet have created the biggest problem of totally unsustainable lifestyles fueled by greed. Thus the climate change, economic meltdown and other consequent social problems are direct result of our greed for resources and energy. Hence the control of greed or better yet the sublimation of greed emotions into higher ones like humility and simplicity can lead to sustainability, happiness and a rewarding life.

Attainment of happiness is the goal of all religions and almost all spiritual writings are about how to achieve it. Most of the religions have focused on renunciation and elimination of desire. Some use this to promise happiness in afterlife. However one can find happiness in this life and world. Based upon the material in the previous chapters we will try to explore in this essay how one can lead a happy life by channeling our desires into fruitful avenues and by curbing or sublimating our greed impulses. All these strategies combined will also lead us to a sustainable lifestyle.

Happiness

A young boy went to a Guru and asked him how he can see God. The Guru immediately saw that the boy was an enlightened soul but too young to be educated in the abstract knowledge of Vedas and Upanishads. He asked the boy whom he loved most. The boy replied "My calf. I play with him all the time. He is my true companion". The guru asked the boy to think and meditate on the calf. After some months the Guru went to see what his young disciple had achieved and found him crying. "I am losing

my mind”, said the disciple “The calf has become so small that it sits on my palm”. The guru advised the disciple to continue meditating on the calf. After some time when the Guru visited the disciple again he was crying and said that now the calf has grown so big that it reaches the sky. Guru knew that the young disciple was on the correct path. He told him to continue further on the same path. Many years passed by before the Guru went to see his disciple. From the disciple’s face the guru knew that he had obtained happiness and had reached his destination. After great difficulty he was able to shake the disciple out of his *Samadhi*. On being asked how he felt, the disciple replied, “Sir, you, I, calf, sky and God are the same!”

Focus on a single thought or a desired object for a long time is the essence of yoga (called *Sanyam* in Patanjali Yoga) and produces tremendous happiness. A possible mechanism could be that this concentration somehow helps stimulate or “tickle” the pituitary gland and gives us a sense of well being.

Happiness is a state of mind. We feel happy and enjoy life through our senses and the mind. Brain processes the information from the senses and our level of happiness is dictated by its processing power. A powerful brain (the processor) which produces deep thought can therefore extract more information from the sensory signals and can give us more happiness since the mind gets satisfied easily. Besides it can look at greater number of eventualities and hence can resolve the issues amicably. A smaller processor obviously needs many more inputs to reach the same enjoyment or satisfaction level. Thus weaker brains need more resources to occupy them and this leads to greed and unsustainable lifestyle. Therefore one of the prerequisites to having a sustainable lifestyle is development of a powerful and smart brain. Such a brain allows us to think deeply or concentrate during which we can get “lost” in processing that information.

A powerful brain or a processor also changes the priorities in life and helps in focusing on getting personal happiness through mental peace rather than on material needs. When concentration on a single thought is carried out regularly and continuously for a

long time, it takes our mind away from our insecurities and hence gives us a feeling of calmness and well being.

The insecurity of human beings comes when they do not have anything to do. "An empty mind is a devil's workshop" is an old saying. Thus activities such as hoarding of wealth, material goods etc. are the result of a shallow mind. Mind seeks enjoyment and gets it in activities like binge shopping etc. A mind which is very powerful is capable of finding enjoyment within itself and makes a person self-contented and happy. Thus the act of accumulation or hoarding of anything is a sign of a lower intelligence level since it is driven by fear complex of loosing out or not having enough.

An evolved human being on the other hand will try to hoard as little as possible and will possess only those material things required for his or her use and enjoyment. This is the essence of sustainability. Modern examples of evolved humans are Gandhi and Einstein who lived very simply and yet produced a very high quality of thought since they were very secure human beings.

Powerful Brain

Geneticists tell us that we are born with a certain type of brain and that puts a limit on its processing power. However any type of brain can be nurtured to work efficiently and it is this capability that needs to be imparted to all children. Surely there will always be differences between brains but with proper nurturing during childhood the average capabilities can be raised very high.

When we are young our brain is powerful and pliable. This is primarily because it is relatively free of memories and psychological knots. Besides there are lots of sex hormones flowing through it⁹. These chemicals are necessary and useful for memory enhancement and hence in producing a powerful brain. Thus to increase the brain capacity and have more focused thinking it is necessary that teenagers should be made to focus on various interesting things and less on sex. Too much sexual activity fritters away these chemicals. Probably this was the basis of celibacy propagated by all religions in different civilizations.

Sexual abstinence is a very difficult thing to teach the teenagers. The evolutionary forces cause a tremendous hormonal flow in young people since procreation is the most important part of life. This hormonal flow should be utilized for making the brain powerful and should not be frittered away. Because of our hedonistic society we tend to create more sexual opportunities which sometimes result in overindulgence. This is disruptive and not very productive. Sex is enjoyable and when practiced among consenting adults in moderation is also good for human health.

Therefore it is difficult to curb the powerful sexual tendencies of the young people. Sex desire should not be suppressed but should be sublimated. We can do this by inspiring the youngsters and making them work hard so that they do not have much time to think about sex and related things. An empty mind is a devil's workshop. This requires that parents and teachers create work environment for children which is challenging, interesting and **physically taxing**. A "soft" society leads to obesity and sexual disorders.

If we want to shield the children and young adults against the disruptive "too much sex" society then we have to first put a reign on the behavior of the adults. If adults want sex to be depicted openly in mass media then it will automatically be seen by the children. Nevertheless it is very difficult to censor out sexual content since in an open society adults have the freedom to do more or less whatever they want.

Thus the ancient Indian schooling concept of 'Gurukul' becomes useful where the children were put in the schools and colleges in isolation and where the focus was on Yoga, learning and sexual abstinence. The practice of Yoga by children will help them to develop the power of concentration which ultimately can produce a powerful brain. Since the brain is pliable during the impressionable age, teaching of Yoga in schools should be made compulsory.

However in the modern world this ancient Indian concept may prove difficult to sell. Also the teachers of such "gurukuls" have to be very disciplined and highly evolved human beings.

Presently teaching profession generally attracts only the lower strata of the society. Still we can aim and plan for modern “gurukuls” which can be excellent schools with focus on Yoga, moral science and sports, besides the regular subjects. Creation of very intelligent children and young adults who will pass out from such schools is necessary for the betterment of society.

At the same time how do we create the conditions for us to think deeply and produce powerful brain? Today's society does not put a premium on reading or thinking deeply about something. The pace of life together with information overload from TV, radio and other electronic media is creating a new generation of humans with very short time-span focus. Deep thought requires energy, application and will to achieve it. Short attention span does not require too much effort and hence is easy on the mind. However if we consciously create in our children from very early age the desire to read which will help them cultivate the habit of imagination and daydreaming, then there is a chance of creating a society which is more focused and happy.

Children who have an active imagination daydream a lot. They create imaginary beings though fully conscious of the fact that they are make-believe entities. Sociologists have been baffled as to why children do this⁶⁰. A possible answer is that this is the origin of *Sanyam* in children. The brain of active children is very powerful and in the absence of any structured thought or focus, starts a movie of imagination. Once this movie is started then there is a continuous flow of thoughts in this direction and the movie gets bigger and bigger till it takes on a life of its own. Children do it because it is a genesis of deep thought and brings happiness to them. This daydreaming can only happen when the child's mind is not bombarded by external inputs, which in present-day electronically driven world is difficult to avoid.

Nature of Desire

It is possible that as we make our brains powerful and expand the boundaries of our consciousness we will need more resources and inputs to keep it occupied. This is the genesis of desire. However

a powerful brain will channel the desires into avenues which will benefit humanity rather than to fuel our greed. In order to do so we must however first try to understand the desire emotion. Thus the questions like what is the sociobiological basis of desire or why do human beings have it and what is the nature of its fulfillment needs to be addressed.

Desire manifests itself in different forms – lust, aim, ambition, control, goal, etc. However, the driving force is the same – power, fame and money and I think it ultimately boils down to control and hence power. Some also call it an ego trip.

Desire is fueled by experience. A living being wants to experience the world. This is an inherent trait of all life forms. We are wired for experience. Urge for maximization of experience fuels the desire. Whether the desire is for sex, money, fame etc. it is driven by the same need to have experience.

As our brains develop (right from our birth) the neurons need to form the memory pathways. This process is accomplished by sensory perception where the inputs from the senses form the memory. We are hardwired to increase our experience and memories. This is the basis of desire. Thus desire and brain are interlinked. As long as brain exists there will always be desire.

One of the outcomes of desire is possession. We feel a need to possess whatever we desire whether it is a person, object or even an idea. This possession helps in maximization of experience. As we absorb this “experience” through our senses, our brain processes this information. It is during this process that we “decide” whether our desires are fulfilled or not. Fulfillment of desires therefore helps us in releasing the “possessions”. Thus a powerful processor or mind can get its desires fulfilled quite easily without physically possessing the objects of desire. While on the other hand a weaker brain needs to possess a lot more things for fulfilling them and this leads to greed. Thus to live a sustainable life it is necessary to have a powerful brain processor.

Desire is a useful and necessary emotion. It allows us to achieve something and be active. Without desire we will be lifeless, dead or like stones. However what we need to do is to

channel our desires so that they get fulfilled without too much taxing of resources, materials and energy. For example a desire to invent a new process, to create a new thought or discovery does not require much energy or resources, say as that required for possessing too many cars or luxury items like a 100 ft yacht or a private jet liner, etc! The desire for material goods which supply our needs and not our greed could be good for humanity at large and will lead to sustainability.

One of the possible ways to satiate the desire for possession of material goods is sublimating it via virtual reality (VR) tools. These tools allow the mind to have enhanced experience. As the technology for virtual reality systems evolves and VR becomes more realistic we will be able to take care of most of our desires with very little use of energy and materials. This will hopefully lead us to sustainability. This concept is explained in more detail in Chapter 24.

Satiation of desire requires energy and material resources and excessive desire leads to greed and hence to unsustainability. The wisdom of "I" or ego keeps a check on the desires. If not, then the mind goes into an ever-expanding spiral of greed and excesses. Unresolved desires produce memory knots or stresses which have the mechanism of always directing the brain to them and creating anger, frustrations and hence depression. This happens because the thought production is channeled or influenced by the existing memories. If the brain has more memory knots of unfulfilled desires then the new thoughts will be centered and focused around them leading to anger, frustration etc.

A stressed mind gets angry very fast. Anger is an emotion, which occurs when things don't happen the way we want. Thus a powerful processor or mind which can coolly and calmly look and evaluate all the possibilities (deep thought helps do that) may have better conflict and anger resolution capabilities than a shallow thinking mind. Thus insecurity and anger may be related.

As explained in earlier chapters the power of the brain processor is increased by availability of its working memory.

This can happen with cultivation of deep thought so that the dissolution of other memories and psychological knots takes place. As this memory increases, the absorption and digestion of inputs also get enhanced since the mind becomes hungry for more experiences and this increases our desires. As our desires increase both in quantity and quality the powerful brain/mind complex starts looking for higher purposes. This “mind opening” experience allows interaction of mind with external and higher dimensional knowledge space and allows us to access the existing information from it - the basis of most discoveries, inventions etc.

Heightened Awareness

One of the aspects of a very powerful processor and an evolved brain is that it also becomes acutely aware of its surroundings. This happens partly because of the need of maximization of experience. The brain seeks ever expanding spheres of experience. Thus it is able to expand its horizons to encompass our world, solar system and universe. This expansion gives us a tremendous sense of peace, tranquility and perspective on our life. **This is the genesis of wisdom.**

Another reason for enhanced awareness is that a powerful brain also becomes an enhanced signal receiver and can easily get information and knowledge from external sources including KS thereby maximizing the experience.

Production of huge human brain is still an evolutionary mystery. Its big size cannot be explained by the pressures of evolutionary forces alone. I feel that it developed so that we can understand the universe and become aware of Universal Consciousness.

Thus the expansion of our horizons or yearning for Universal consciousness gives us an awareness of reality and life in different dimensions. This is the genesis of “God Sense” that each one of us possesses irrespective of our caste, creed or religion. It is possible that our brains have this in-built sense because this earth was seeded by an intergalactic civilization (this aspect is explored further in Chapter 22) and hence through ages we have carried

that genetic code via our ancestors who were more aware than us of the reality of other planets and of higher dimensional space. In fact as we evolve technologically and otherwise this awareness will become stronger and the boundaries between our four and higher dimensions will become blurred. This concept is also mentioned in Patanjali Yoga Darshan and the modern science and technology make it possible to visualize it and probably experience it.

This awareness of higher dimensional space and reality can also make us fearless and remove our fear of death since death is a simple transition between various forms and dimensions. This is also the lesson of Gita. With fearlessness comes the ability to do new things and follow uncharted paths which can give us a quantum jump in our technological developments and understanding of natural forces.

Because we have roots of an advanced galactic civilization, the concept of gods with super human powers and dazzling lights are embedded in our memories. So is the desire in us to travel intergalactically. However with our present technologies it is not possible to do so. Presently the easiest and the most energy-efficient way to travel from one planet to another is via soul transfer. This has been preached by almost all religions throughout the ages where reaching heaven after death was the ultimate goal of existence. I believe our ancestors understood that this was the easiest way to overcome gravity barrier of earth and hence the focus on future births in heaven etc. (Chapter 3).

Our roots in intergalactic space also made us aware and focused on the concept of heaven and hell. Heaven was always the great place where we originally came from and probably must have been a very technologically advanced civilization. It is also possible that this was a place devoid of any physical or emotional pain.

As we become technologically advanced and become gods ourselves we will eventually loose the “god” thought and become more tuned to making this world a heaven. Once that happens then we will talk less about heaven and future births and more

about what is possible now and can be achieved. Also we will have no problem in being born again and again on his earth and with our technology will become an inter-solar and intergalactic traveling civilization - just what the gods may have been.

Life as a Continuum

As we gain more powers and get the ability to play God we will start changing the tapestry of nature by our technology. Since each one of us has a limited time frame to live we have this arrogance that we should accomplish everything in our lifetime. This causes greed and ultimately misery. Nature also effects changes but those changes take place in geological time scale and after the systems are in dynamic equilibrium with the surroundings. Human-mediated changes powered by greed do not allow the systems to remain in equilibrium with the surroundings. That is the reason for our creating problems with the environment and producing conflicts with each other.

However if we consider that we are a continuum, i.e. we will continue on this planet earth for a long time in different life forms and that all of us will work together for the benefit of mankind, then the task at hand loses a lot of its urgency and time its immediacy. As individuals we have a free will and work for our own good but as a part of the whole mankind we all move in a band towards speeding up its evolution.

The only requirement for this scheme to succeed is for reincarnation to be a reality. For people who do not believe in it the above framework can create conflicts and problems. This theme will be dealt in greater details in the next chapter on death and reincarnation.

If we believe in reincarnation then the time stretches and we get a better perspective on life. It causes all our actions to become focused on achieving the general good of mankind for its evolution on a large scale. With this perspective one also gets a global outlook and the country boundaries vanish. And this is the essence of being a human. In a way the development of science and technology allows us to proceed in this manner though most

of the times we are not guided by the principle of continuum. Nevertheless the desire to leave a better world for our future generations is in effect the product of this idea. Still the issues of control of technology create hindrances in the free flow of ideas since our greed comes in the way. This happens because of our insecurities which lead us to arrogantly focus only on our present lifetime.

Nevertheless this behavior cannot change overnight but will do so slowly and I feel that in another 100-200 years we as human beings will become more benevolent and sharing.

Thus to live a happy and sustainable life we need to make our brain very powerful by Yoga and also by conserving energies which are too often frittered away in unfulfilled desires and emotional knots. This process can also help us in curbing our greed impulse so that all of us can work together with the available resources to make this world a better place where each one of us can live a sustainable and emotionally satisfying life.

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6. Death, Karma and Reincarnation

Death is the most certain thing for any living entity and yet we know so little about it. It may come early or later in life but the inevitable always happens. Yet we carry out our actions and behave as if we are immortal and death does not enter into our scheme of things. However if we understand death then we will really understand life and this will help us to live it fruitfully and happily.

In almost every society the spiritual writings are about the art of living which prepares human beings for death. Thus they contain intricate details of heaven and hell. Some religions also make the description of hell extremely frightening so that people will change their behavior to avoid it. Majority of spiritual writings are about how to live properly so that one can escape the cycle of birth and death. In all these writings the underlying philosophy is of the continuity of soul.

Thus Egyptians believed that eventually resurrection will take place and so elaborate mummification ritual for treating the dead body was developed. Similar has been the case in other religions.

In Indian Yogic tradition transition of soul from body to body is like changing into new clothes. It goes through all the living species and evolves towards godhead after its karmas (Sanskrit for actions/deeds) are resolved through various births. Katha Upanishad, Patanjali Yoga Darshan and Brahma Sutra do talk briefly about the rebirth of soul in human form and how it can also be transformed into various species⁴³. Patanjali Yoga says, “The transformation of one species into another is caused by inflowing of nature. Good or bad deeds are not the direct cause of this transformation but only act as a breaker of the obstacles to natural evolution – just as a farmer breaks down the obstacles in a water course so that water flows by its own nature” ⁴⁴. Hence the transfer of soul from one species to another seems to be an accepted thesis in Indian religion.

A direct evidence of continuity of soul has come from people who had near death experiences (NDE)⁴⁵. NDE seems to happen

when a person is declared clinically dead but after some time returns to life. Interestingly enough nearly all the descriptions of NDE are very similar and talk of getting out of the body and going through a dark tunnel and then coming into brilliant white light. Depending upon the religion of the person he or she sees Christ, Krishna, Buddha or any chosen deity. For agnostics or atheists there is a feeling of tremendous warmth and happiness in the presence of white light.

Quite a number of people have also reported that during NDE their whole life flashes by and almost all their past actions become visible. Probably it is because the memory of their present birth is still fresh. Then somehow the self is told that his/her time to die has still not come and the person "wakes up" in the body, which is being resuscitated. Interestingly enough during this period there is no concept of time. In majority of cases tremendous change in attitude towards life and death takes place in people who experience NDE. They consider dying as a pleasurable experience and are not afraid of death anymore.

One of the most detailed treatises on death and dying is the Tibetan book of Living and Dying⁴⁶. Most of the material in this book is based on Indian Yogic system though Tibetan Buddhists give some terms Chinese sounding names. In this book a good description is given of what happens to the soul after death and till it gets a new body. Tibetan Buddhist Lamas call this transition state as Bardo (Tibetan word for transition). They identify the bardos as:

1. Natural bardo of life. This extends to a person's lifetime.
2. Painful bardo of dying. This is the period, which lasts from the beginning of process of dying until the clinical death.
3. Luminous bardo of dharmata is the period after the death experience and is manifested by varied colors, sounds and light. This is similar to NDE.
4. Karmic bardo is the time interval, which lasts till the soul gets a new body. The Buddhists' believe in the Indian philosophical system that getting a new body is dependent on the karma

(Sanskrit for action) of previous births. Similar beliefs exist in other religions. Hence one's actions or karma in this life seem to play a significant role in how one dies and in what form they are reborn.

Karma and Fear of Death

Karma is a Sanskrit word meaning action. However it embraces the whole meaning of living. Thus according to law of karma your actions or deeds (both good and bad) decide your future in this life or the next life. Law of karma occupies a central position in Indian philosophy. There are tomes written on it but here we will focus mostly on how it relates to death.

According to some commentators the law of karma is very deterministic. They claim that you are born according to your karma and things happen to you in your present birth because of your past karmas etc. Hence one cannot change the present life. This however negates the whole basis of Yoga which claims that one can change the *Sanskars* (memories) and hence ones life⁴⁷.

Each one of us is born with a unique genetic makeup, which provides a basic template for our general behavior. This behavior is further modified by the surroundings that one encounters in life. I therefore believe that each one of us has the power to change our destiny and our memories by our actions in this life. Our actions change the neural pathways in the brain and hence the mind which guides us to our future course of action. Thus individually we have a free will to create our own destiny but collectively we all maybe guided towards mankind's evolution.

As we saw in Chapter 1, each one of us can be thought of as an individual molecule moving "randomly" in the sea of humanity and according to the forces of opportunity acting on us. But all of us together may produce a "dissipative structure" which is the evolution of mankind. Thus the evolution of mankind towards a greater spiritual and technological sophistication is **quite certain and therefore deterministic**.

Also according to Indian Yogic system the time of death is governed by the karma of a living entity. When the karma's course

is finished then death takes place. It is not clear how one can find out what constitutes karma, its duration or how many karmas a person accumulates during his/her lifetime. Patanjali Yoga Darshan simply states that *Sanyam* on his/her karma makes it possible for the Yogi to calculate the exact time of his death⁴⁸. This also suggests that a Yogi has no control over his death though he may know the time of exit. However there are many instances of great Yogis who have left their body by their own will and hence can certainly select the time of their departure^{31, 36}.

An interesting aspect of time of death was given by the great Indian mathematician S. Ramanujam who used to say that the death of a person takes place only at a certain space-time junction point. He never explained what that junction point was. Ramanujam who died in 1920 at the young age of 32 was one of the greatest mathematicians of the last century. He was basically a spiritualist and mathematics was a by-product of his spirituality. He said many times “an equation to me has no meaning unless it expresses a thought of God” ⁴⁹. He had some powers which made him clairvoyant and hence could predict events. He even predicted that he would die before the age of 35. Quite a number of his friends and relatives used to come to him for consultation about their future and quite a number of times he urged them to move away from their present living place so that the space-time junction point could be avoided.

Though all the living entities are afraid of death, the desire to know how and when death will take place is very strong in human beings. The first impulse on sensing impending danger is to protect oneself and survival is the cornerstone of Darwinian evolutionary theory for all living entities. The possible reasons for death fear could be:

1. The experience is very traumatic. It is accompanied by loss of identity and sometimes with tremendous physical pain.
2. The living being does not know “instinctively” what will happen to its “memory” or form. For example whether it will find a new body or will it be fixed in space for a long time.

So there is a fear of unknown. All living entities are wired in such a way that they are afraid of losing their body and with it their form and identity. If a soul can exist without a body then we should not be afraid of death. However the form or body, which gives us the sense of 'I', is very afraid of losing its identity.

3. The process of learning or moving to a higher level of consciousness is disturbed and delayed. For example 20-30 years or even more can be lost in the process.
4. The living entity loses its ability to change "memory". This ability comes with the brain attached to the body and with death the body ceases to exist. As we saw in Chapter 4 the proliferation of species in the initial stages of evolution is a direct consequence of the desire of space "G" to have and keep a body. It allows the templates of memory from that species to continue.

Blocking the Pain of Death

Since the soul clings to the body, the shedding of lifetime memories at the time of death is painful. That is the reason the Indian Yogic system stresses the liberation of soul so that the painful cycle of birth and death is stopped.

Yogis also believe that reduction or elimination of pain during death would remove its fear. One of the major aims of Yoga therefore is to make the body and mind powerful enough so that pain is either reduced or removed completely.

Why there is pain and what is its purpose? Pain and pleasure are complimentary and are part of life. They are the attributes of the body. The intense physical pain is probably an outcome of the body trying to repair itself and requires very intense brain concentration for it. All other sensory inputs or other thoughts are blocked by the pain sensation. This concentrated thought might help the brain to heal the body. This is also the mechanism where single-pointed concentration helps in memory removal. Pain therefore could be one of the key mechanisms for removing or modifying memory. Any intense experience can do the same. For

example intense pleasure of love for a chosen deity is the genesis of Bhakti Yoga (Yoga of devotion)⁴¹.

Interestingly, emotional and physical pains and their intensity are similar in nature and the brain does not differentiate between the two. Recent studies have revealed that fMRI scans of the subjects showed that the pain of rejection (emotional pain) and stubbing of big toe (physical pain) illuminated the same part of the brain⁵⁰. We also show this similarity intuitively in our vocabulary with terms like broken heart, heartache etc. Emotional pain allows the brain to intensely focus on resolving the conflicts and at the same time helps it to send and receive thought packets.

Advanced Yogis claim to have developed a mechanism of blocking pain from reaching the brain through Kundalini Yoga. Kundalini is a very ancient Indian Yoga system, whose practitioners believe that there is energy (could be cerebrospinal fluid) which is coiled like a female serpent (Kundalini is the Sanskrit word for a coiled female serpent) and lies at the base of spinal chord⁵¹. By Yogic process (mostly by imagining and willing it) it can be raised in the central canal of the spinal chord to reach its ultimate destination - the brain. Yogis claim that once Kundalini reaches the brain, liberation of a yogi from the cycle of birth and death takes place. Raising it is done step by step and it takes many years of practice before Yogis can raise it up to the brain. Yogis also claim that conservation of sexual energy tremendously helps in this process.

Kundalini Yoga helps to remove the sense organ inputs to the brain from various parts of the body. In medicine the pain blockers do the same. The main pain sensations from the body come through the spinal chord and probably raising of Kundalini means blocking the pain centers in the spinal chord progressively starting from the base of the spine and reaching to the top of the brain. This effectively detaches the mind from sense organs. Shri Ramakrishna used to say that as he started raising his Kundalini, his body went through the process of locking itself starting from the base of his spinal chord so that he lost control of these parts as the Kundalini traveled from the base of the spine to the head⁵².

Yogis believe that with practice of Kundalini Yoga the mind gets completely detached from the body. This helps in developing memory or neural pathways so that at the time of death it is quite easy for the memory or soul to leave the body painlessly. Besides, they believe that with “pure soul” (without the sense organ memories attached to it) it is possible to achieve salvation from the cycle of birth and death. This is the central theme of Indian Yogic system. Patanjali says that once the *gunas* (result of karma) are resolved through Yoga then the soul becomes pure (without memory) and merges into Universal Consciousness⁵³.

Death and Memory Removal

At the time of death it seems the ego sense ‘I’ or sense of identity has to shed the memory of attachments of sense organs. It is through the sense organs that we perceive the world and carry out our actions; hence it is these organs which give the sense of identity to a living entity. As we have seen earlier shedding of these attachments allows the removal of lifetime memories and hence is painful. Thus almost all memories are shed except the “basic memory” which is then transferred. We do not know what that basic memory could be.

An analogy from modern computers will be useful in explaining this memory transfer. At the time of death there is a transfer of software (basic memory) from the body. In a computer a person transfers the software onto a new machine. In transfer of soul it is done on its own. There is no agent of transfer and hence it is guided by the forces it encounters just after death. Just like software is useless without the machine similarly the soul cannot do anything without the body (hardware). Body allows the soul (memory) to change its character just like one can modify the software through a computer machine. It is only through the body that the brain receives all the sensory inputs and the body acts like an antenna for the mind. Hence the strongest desire of the soul is to get a body. This could be any body and thus the possibility of its transfer among species.

Death is the most traumatic experience for a living entity and allows all the brain neurons to fire in a laser like fashion. This very concentrated thought just before the final exit allows the memory or soul to be transferred to the higher dimensional space. We have shown in Chapter 2 that this space is rigid and hence could be the realm of spirits and ghosts. Thus it is quite possible that all souls immediately after death may remain in suspended animation till they get a new body. However one is not sure if the memory transfer takes place between all life forms or is it governed by a certain brain size. Thus there could be a cutoff brain size below which the transformation from humans to other life forms may not take place.

The chances of ghost formation are much more in sudden death conditions. For example people who die suddenly because of a heart attack, accidents, murders etc. may not get enough time for the sense organ detachment. Thus the souls of such persons may retain the memory of body form for a little longer time which may result in the ghost form. We still do not know for how long the "ghost structure" can remain and what type of energy is required to maintain its stability. Those who die of natural causes get sufficient time for mind withdrawal or sense detachment of the soul and may follow the Tibetan path of four bardos.

The spirits and ghosts being in higher dimensional space might have the powers to affect life in our space. Such instances of spirits and ghosts affecting life have been documented and recorded in all civilizations. Even Patanjali alludes to these beings which reside in "higher places".^{53(a)} However the "memory" of Yogis and enlightened souls guided by their willpower and powerful minds, could transcend the realms of spirits and ghosts and can go into even higher dimensional space.

Reincarnation and Passage of Memory

There are people who do not believe in life after death or reincarnation and think that after death everything finishes with the body. However there is a strong proof from a large number of cases where there has been a total recall of past lives and events

by individuals (especially children) and these cases have been reported in all societies and in almost all religions⁵⁶. Hence we will take the data of these cases as experiential fact and assume that there is reincarnation and life after death.

There have been many instances when rebirths have taken place in the same or nearby households brought about by a very strong will of the loved ones. The intense love creates a powerful force for the soul to be so reborn. However it is not known when and where the rebirth will take place. In a celebrated case the Indian saint Shri Ramakrishna described in detail how he and a very highly evolved Yogi decided to be born together on earth. He identified that Yogi as Swami Vivekananda, a great spiritual leader of India. However it took 20 years for Shri Ramakrishna to find out about Vivekananda although he was born within 20 km of where Ramakrishna was staying! Besides Vivekananda was born 40 years after Ramakrishna and the two met each other by chance in Calcutta⁵⁷.

Since time immemorial human beings have been curious regarding what happens to all our actions, ideas, memories etc. after our death. There have been discussions on it in Upanishads and Mahabharata but most of them skirt the subject by stressing that one should lead a moral and upright life so that death is welcomed as a friend rather than an enemy⁴³. We will however explore this subject in the light of what we have discussed in previous chapters. Hence it is possible that after death the following may happen to all the memories and information that a person learns during his/her lifetime:

1. Information generation is an evolutionary process. Any profound or deep knowledge produced goes in the knowledge space (KS) and it continues to increase. It is never reduced. Also all our powerful emotions and information, whether good or bad, goes into the KS. This space is filled with such knowledge from all over the Universe. Thus the old saying that all our actions may come to haunt us may mean that the information is never lost.

2. The soul passing from one body to another carries the basic memory only. We are not sure presently what this memory is and what is its structure. However it could be the user name and the password just like in the Internet where these two pieces of information allows one to access all the information from the cyberspace! Once it gets into a new body and as the brain reaches full formation, then it can access the emotional information of its past births from KS. This is the genesis of reincarnation and is analogous to cloud computing.
3. The basic memory transfer makes more sense energy-wise since it will be difficult for the transfer of soul from one body to another if large amount of memory is attached to it. Besides one of the aspects of getting a new body is that the memories of old body are removed and the “life” starts with a clean slate. Otherwise the burden of past memories can make living quite a chore since the heavy baggage of these memories will not allow the new experiences to be gained easily. Nevertheless the memories in KS effect a person’s actions indirectly and thus all our past actions can come to haunt us.
4. Probably these memories in KS are the *gunas* that Patanjali talks about⁵³. They can be modified or removed through Yoga. With the removal of *gunas* their effect on an individual vanishes and liberation takes place.
5. It is possible that the memory of past births maybe accessed during dreaming process. During the early years of our life (between 6-10 years) our brains are fully developed but the ego sense ‘I’ is nascent and still developing. Thus it is possible that during dreaming when our nascent ‘I’ is weak and nearly absent the memories of past life can be accessed from the KS. This is akin to prophetic dream process which has been the basis of great visions and discoveries throughout the history of mankind (Chapter 9). This ability to access our past lives however gets diminished as we grow older since the ‘I’ becomes stronger with addition of new experiences and memories.

6. The KS is of two types. The first that stays with earth or other livable planet. This includes the books, memories, other materials and the “atmosphere” (both spiritual and otherwise) of earth or planet. This KS moves with the earth and earthlings can dip into it to get the knowledge so that the evolution of mankind takes place. The other KS is in the Universe and as the earth passes through it we can access it and produce quantum jumps in our knowledge. The knowledge in this KS exists because of actions of civilizations more advanced than ours.

One of the major aims of all life forms is to get a body – preferably a human one. Getting it is important in evolution of knowledge since a big human brain allows us to tune into the knowledge space (KS). Bodies belonging to other species cannot do so because of their small brain size. Hence if the soul goes into other life forms then the overall knowledge accumulation slows down and memories of past births cannot be changed or erased.

In order to avoid memory transfer after death into other species we need to cultivate our minds in such a manner that at the time of death we have a powerful structure of our thought so that most of the extraneous memories are shed and we create a great “Spiritual mass”. Practice of yoga helps us in doing this. Creation of “Spiritual mass” is the only way to make sure that the transition of memory from one body to another human body is smooth and that it can also go to other planets by will. Passage of soul to other planets has been discussed in Chapter 1. It is possible that our ancient spiritual teachings about *swarglok* (heaven), etc. came because this planet was not a very comfortable or hospitable place and hence the focus was to release the soul so that it could go to other hospitable planets from where we might have originally come from.

As our technology advances we will be able to make our future world a very hospitable place so that the body could be made strong and healthy through Yoga or designer drugs. This will help to keep the mind and brain fit so that we could leave the body at will. Thus in future most souls may be able to produce a

high “Spiritual mass” at the time of their death so that they could either stay here on earth by will or could go out of the Earth’s gravitational field. Some Yogis claim that there are great masters who came from other worlds, have chosen to live in this world for its upliftment, and are hundreds of years old⁵⁴.

The “Spiritual mass” can be produced when the brain is working at its fullest and capable of producing deep thought in higher dimensional space. This is what great Yogis can do and is the basis of whole Yoga. As we age our brain loses its suppleness and gets petrified. Hence it cannot fire all the 100 billion neurons in a laser like fashion at the time of death. This limits most people’s capability to get a new body by will. Some of the great spiritual leaders like Christ, Adi Shankaracharya, Sant Gyaneshwar of Maharashtra, Swami Vivekananda etc. left their bodies before they reached 40 years of age and when their brainpower was at its prime.⁵⁵ For others who cannot produce the critical “spiritual mass”, rebirth is by chance or strongly willed by their loved ones.

Basis of a Good Life

How does one lead his/her life so that it is happy and death is painless and is welcomed more like a friend when it comes? Tomes have been written on this subject and the great masters of this world like Christ, Buddha, Patanjali and others have spoken about it from their direct experiences. It will be therefore arrogant on my part to say anything more than what they have already said. However we can try to understand it from the perspective of our theory on deep thought.

The whole basis of life is to have continuous happiness and joy and that is possible with a very healthy body in a very hospitable world. The self can only enjoy and be happy with a body (preferably a human body) since it provides an anchor to it and allows the making and breaking of memories.

One of the keys to happiness is reduction and complete removal of greed. Greed creates tremendous conflicts and all round unhappiness. Removal of greed can be achieved by cultivating a nimble brain via *Sanyam*. A healthy body can help

in creating a nimble brain. The nimble brain has a tremendous processing power and hence a small amount of data is processed very efficiently to gain useful information. This helps the mind to "get satisfied" easily and helps in satiating the desire so that the person can move on. This is the major step in greed reduction.

Sanyam also allows enough working memory space in the brain so that majority of 100 billion neurons are available to focus on a single thought. This becomes possible only when we have less memory locked up in the brain about mundane and routine worldly activities and attachments. Also there should be an excellent conflict resolution mechanism developed internally. Deep down we should honestly evaluate our actions and should be able to live with them in peace. This act can help in freeing the mind from psychological knots, which can take up a major portion of the memory. Removal of these knots may help make the mind calm and fit for deep thought. The final word on this subject therefore belongs to Patanjali who says, "Undisturbed calmness of mind is attained by cultivating friendliness towards the happy, compassion for the unhappy, delight in the virtuous and indifference towards the wicked"⁵⁸.

Making this world a better and more hospitable place can also help in calmness of mind and internal happiness. This will help us fulfill both our physical and emotional needs and can help all humans to live a very full and happy life. For most of us this planet is the only home we have. This means that besides our personal evolution we should also contribute as much as possible to mankind's evolution. In this, technology will play a very major role. It allows us to take care of our physical needs and with its progress and evolution will allow us to live in a sustainable manner. Thus to my mind the contribution of Edisons, Fords, Einsteins and Newtons of this world towards mankind's evolution is at par with that of spiritual leaders like Buddha, Christ, Patanjali, etc.

Mankind has always aspired to immortality. Thus by means of chemicals, drugs and spiritual methods humans have always strived to prolong their lives. Yogis and practitioners of healthy

body cult claim that human body can theoretically live for 125 years. There are some Yogis in India who claim that some masters have lived even for 300-400 years!⁵⁴ I believe that once our technology becomes very advanced then it will be possible for humans to have a long life. Whether that long life will be productive, happy and emotionally satisfying will depend a lot on how hospitable we make this planet earth. I believe a combination of spirituality and technology can provide a basis for achieving this goal (Chapter 19).

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Deep Thought, Happiness and Other Things



7. Human Thought, Karma and Bondage

It is said that one of the first yogic sadhanas that Aurobindo Ghosh – a famous Indian Yogi did under his guru Lele was to understand the nature of thought packets¹⁰⁴. By stilling his mind or emptying it of thought waves he could see the thought packets coming from external sources and by actively intervening as they came he could get rid of their effects on his mind. It was as if he created a filter system similar to that used by the present e-mail programs to get rid of spam mails. Similar process was described by Swami Vivekananda who said that when he concentrated on a person or an object, he could see the thought packets connected with them as writings on the blackboard or sky.

Brain is not only a receiver but also a transmitter of thought packets. With practice of *Sanyam* or Yoga we can tune our brains to receive knowledge and thought packets at will and to send them to others. This sending and receiving of thought packets is governed by the strength of concentration. As we saw in Chapter 2, a deep thought which is a product of *Sanyam*, can go to great distances via higher dimensions whereas mundane thoughts cannot be transmitted to large distances because they attenuate rapidly.

How can we perceive thought packets actively? Patanjali says that once the mind is completely calmed i.e. devoid of any thought waves then it becomes like a pure crystal which takes up the color from the object which is nearest to it. Probably this is what Aurobindo Ghosh did.

However this calming of the mind by removal or suppression of thought waves should be done carefully under the guidance of an expert guru because in the absence of strong will power and *vivek* or wisdom, the empty mind can be controlled by the dangerous beings or thoughts which may be nearest to it. The old saying “An empty brain is a devil’s workshop”, is very apt.

Human emotions are a product of both internal working of our brain and external stimuli. Thought packets are a major

external input and can make the mind work in a certain manner. Thus when we think about a certain event or a person the internal memory is reinforced by external thought packets. In quite a number of cases our thinking about somebody or an event may be triggered by external thought packets received. It stirs up memories which sometimes make us act in a certain manner.

In order that we should not be unduly perturbed by external thoughts we should develop a mechanism to stop them. Though all of us to a lesser or greater degree have the ability to receive thought packets, only evolved people like Yogis and highly sensitive people can perceive their source to stop them. This active perception of the sources of thought is called the ability to read somebody's mind.

A simpler process for ordinary people to keep such thoughts at bay is to think deeply about certain things. Thinking deeply helps in occupying the brain and is like creating a shield for the mind so that it is not affected by external thoughts. This is also the genesis of Karma Yoga where one keeps on doing work without any desire for a reward. This helps the mind to focus fully on the work and there is little opportunity for it to be perturbed by any other external influence including thought packets.

Active reception of thought packets is a double-edged sword. It allows us to plan ahead since one can know sometimes about what the other person is thinking. However it also informs us sometimes about the unsavory thoughts that somebody might be having about us. This does not help in interpersonal relationships and hence sometimes ignorance is bliss.

This externality of thought is the genesis of human bond. Thus the people with whom we have close emotional bonds send their thought packets more frequently. Somehow our brain develops neural pathways which are more conducive to getting these thought packets easily. It develops a mechanism by which it immediately recognizes the thought signatures of loved ones. These packets then make us act in a certain way and are the cause of karma or human web of love.

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8. Prepared Mind Gets Universal Knowledge

There are very few people in the world on whose head something or the other has not fallen. Yet it was Newton who immediately grasped the meaning of gravity when an apple fell on his head⁶¹. Similarly when Einstein heard that a painter had fallen from the roof, he went to see him in the hospital and asked him how he felt while falling down. The painter's reply that he felt weightless propelled Einstein into formulating his General Theory of Relativity⁶².

Both Newton and Einstein and countless other discoverers of truth have produced great ideas from every day observations because of their prepared minds. Prepared mind is an outcome of a very deep thought on a particular subject for a very long time. It is the *Sanyam* of Patanjali Yoga Darshan.

So how is the knowledge perceived by the prepared mind?

Knowledge is of two types – internal and external. The internal knowledge is the outcome of information stored in the brain and its churning and processing by deep thought. External knowledge is gained when the deep thought interacts with it in the knowledge space (KS) as explained in Chapter 2. This interaction takes place when the prepared mind produces a thought whose template starts actively matching the object of perception and with *Sanyam* on it the thought template eventually matches the object in a lock and key type interaction leading to knowledge. Hence with deep thought or *Sanyam* on a particular thing for a long time the brain can become very sensitive and a powerful receiver of knowledge. Such a sensitive brain can identify itself with any idea or object in the world. Once Shri Ramakrishna, while in a heightened state of awareness, saw a person walking on the grass and felt as if that person was walking on his chest! He had identified himself with the grass as if it was an extension of him³¹.

The knowledge about the Universal Consciousness or God or how the Universe is made already exists in KS and is accessed whenever the earth passes through this space and hence is time-dependent and not person-dependent. Thus even if there was somebody else other than Newton or Einstein they would have received the knowledge provided they had a prepared mind. This is mostly true for quantum leaps in our knowledge. The incremental knowledge comes via the regular processes. It is also the reason that quite a number of people with prepared mind get similar ideas simultaneously and independently. The renaissance period in Europe and spiritual awakening in India in late 1800's are some of the examples when a large number of enlightened souls pushed the frontiers of knowledge ¹⁹. As the earth passes through the KS it seems to get somehow great thoughts in human form. This may be the easiest and energy wise very efficient way for knowledge seeding of earth.

Since our minds are the product of the same time frame as the Universe it can be conjectured that we cannot think more than what already exists in the Universe. At best we can discover the already existing truths. Thus the products of even our wildest dreams and imagination exist in KS somewhere in the Universe. Prepared mind helps us to discover them.

How does one prepare his or her mind? The only way to do so is by hard work and great discipline. Some people do have the genetic makeup for a nimble brain but a discipline of *Sanyam* has to be inculcated. Knowledge comes only to those who pursue it vigorously as stated in Patanjali Yoga Darshan. The power of the will allows us to prepare our mind to receive Universal knowledge and liberate ourselves. Hence a common saying that gods help only those who help themselves points to the fact that hard work is necessary for mind preparation.

When a person is in deep thought the ego sense also vanishes. Ego arises when the inputs from senses are active. In deep thought the person's concentration blocks the inputs from the senses and hence the ego sense is suppressed. Therefore a continuous practice of Yoga and *Sanyam* can help in ego sublimation into

Universal Consciousness. Similarly by principle of equivalence when there is no 'I' or ego then the prepared mind should be able to perceive the Universal knowledge. Such a thing sometimes happens during dreaming process where 'I' is partially absent. There have been many celebrated instances when people who have been thinking very deeply about certain problems have received profound knowledge during the dreaming process. For example Kekule dreamt of the benzene structure and the idea of Dandi March came to Gandhiji in a dream during the early hours of morning. That is the power of prepared mind.

Deep thought or *Sanyam*, besides producing happiness, also helps the brain in offloading memories. Yogis have known all along that through Yoga one can shed the *Sanskars* or memory and achieve liberation. Recently scientists have photographed for the first time the formation and dissolution of memories in rat brains¹⁷. It is quite possible that under intense stimulus of *Sanyam* the same dissolution of memory may also take place in humans.

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9. Designer Dreams through Yoga

In 1953 three major events took place. The Everest was conquered by Edmund Hillary and Tensing Norgay, Watson and Crick discovered DNA's structure and a young Ph.D. student Eugene Aserinsky in U.S. discovered rapid eye movement (REM) sleep⁶³. During REM sleep the brain is extremely active and produces dreams. This was the beginning of whole new area of research in sleep and dreaming. Now more than 56 years later there has been tremendous progress in mountaineering and genetic engineering but sleep and dreams remains as much of a mystery as before.

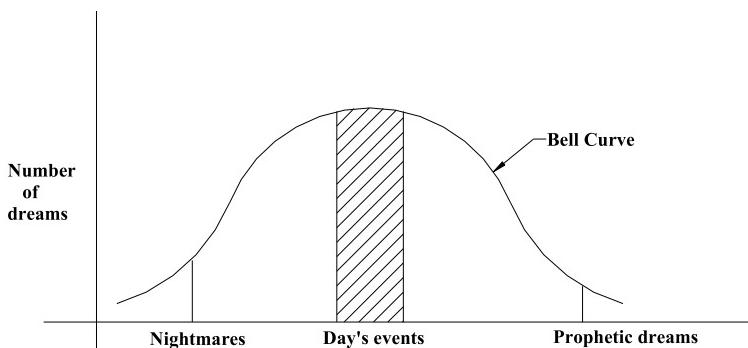
Yet in every religion and society dreams and sleep have been thought to be mechanisms to connect the present physical world to that of supernatural. Thus before Buddha's birth his mother Queen Maya dreamt that a white elephant had entered her body⁶⁴. Similarly the mother of Shri Ramkrishna dreamt that a small green figure, which she identified as God, was telling her that he will be born in her house⁶⁵. Also mother Mary dreamt about the birth of Christ. There are other innumerable instances of prophetic dreams in the annals of history of mankind.

Similarly there are many celebrated cases where persons have produced wonderful inventions and solutions through their dreams. Kekule's benzene structure, Mendelyeev's invention of periodic table, Howe's invention of sewing machine and Neils Bohr's atomic model came in their dreams. There are also large numbers of examples where scientists, inventors and technologists have literally dreamt up solutions to problems which they could not find in the waking state.

How does mind produce such prophetic and solution dreams? During dreaming there is blockage of sensory inputs and thus the ego sense 'I' is weak and nearly absent. The sense of identity 'I' comes with the body and the sense organs like eyes, nose, ears, etc. With 'I' being weak during sleep the brain allows free reign to random thought patterns. These thoughts emanating from existing memories in different parts of the brain produce dreams. The dreaming process therefore follows the

normal distribution (the bell curve), where majority of people generally dream about a day's events and activities⁶⁶. Scientists claim that the day's learning and the information overload from the sense organs is processed and consolidated in the memory during sleep. This type of dreaming process produces disjointed and sometimes nightmarish dreams since the random thought patterns produce a surreal movie. Scientists claim that in REM sleep the brain somehow ignores the obvious in favor of the crazy, the unexpected or the bizarre. It is somehow biased towards activating the weak neural connections⁶⁶.

However under certain circumstances, about which very little is known, the brain synchronizes the random thoughts into a powerful single thought. This is almost like a *Samadhi* where 100 billion neurons of the brain synchronize in a laser like fashion to produce a higher dimensional thought signature. It is quite possible that with weak 'I' the random thought patterns may sometimes resonate with the earth's gravity field and produce this synchronized thought. This thought connects us to the higher dimensional space – time continuum from which we get the knowledge and powers of clairvoyance. The probability of this type of synchronization is very small but still is finite and lies at one end of the bell curve (Figure below)⁶⁷. This synchronized and deep thought leads to prophetic and solution dreams. Quite a number of people sometime or the other in their lifetime are blessed and do get such dreams, which help us understand the



existence of higher thought and reality. However such prophetic and solution dreams come only to those who have a prepared mind and have been thinking deeply about these problems.

At the same time the prophetic dream process may also allow us during our early years, to access memories of our past lives (Chapter 5).

What can we do to produce prophetic and solution dreams? Since the ever present director-the ego sense 'I' is absent during the dreaming process, we have no control over dreams. However, we can control our day's events which ultimately are reflected in our dreams. Yogis have all along claimed that *Sanyam*, which is a combination of contemplation, reflection and *Samadhi* helps in producing a powerful thought process which ultimately leads to a non-REM or dreamless sleep. Recent evidence from sleep research corroborates it. Scientists have discovered that REM and non-REM sleep are totally dependent on how active the brain is during daytime⁶⁶. The MRI scans of the brain of sleeping volunteers show that most of the dreaming activity takes place in the region of the brain which was most active during the daytime. Scientists have also discovered that non-REM or slow-wave dreamless sleep occupies the central position in the sleep process. The information and memory consolidation process takes place in the brain only during non-REM sleep. Hence REM sleep is simply a mechanism for the brain to check whether the memory consolidation has taken place. Besides it also helps us remember dreams.

Thus to produce happy and productive dreams one needs to be very active mentally and physically during waking hours. Whatever memories are formed during daytime are somehow reflected in the dreams including the prophetic dreams. Thinking deeply about an idea or a problem helps create neural pathways, which somehow act as an "attractor" and thus helps in synchronizing the random thoughts in dreaming process towards a possible solution. These neural pathways become stronger with passage of time. Probably the solution dreams of great inventors also came because of the very active prepared mind during waking hours.

There is still no single definite theory of sleep and dreams. However the jigsaw puzzle is slowly being assembled by research inputs from all over the world. As our science and technology advances we will probe deeper into the mysteries of sleep and dream because they provide the best windows for getting a peep into the workings of human mind and ultimately will lead to the discovery of what is thought.

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10. Deep Faith Helps Overcome Fear

Shri. Ramkrishna was very fond of telling the following story. A padre went to an island to preach. He went to a hut of an illiterate villager and heard him shouting and being angry with somebody. The villager saw the learned priest and came out and told him that he is trying to bathe and put his Gopal to sleep but being a naughty child he does not listen and hence his anger. The Padre wanted to see the child and was aghast to find that it was an idol of Lord Krishna. He scolded the villager, saying that God is formless, infinite and beyond such childish playthings. The illiterate villager thought the learned priest may be right and started taking lessons from him. After a couple of months the priest thought that his disciple had learned enough to follow the right path and hence left the island by boat. He must not have gone far when he was amazed to see the illiterate villager running after him and shouting to stop the boat. When the disciple reached the boat he was crying and told the padre that he had forgotten the name of the formless God and hence could not recite the name and pray. The priest was speechless and finally asked the disciple how he could come running on water. The disciple replied "After you left I became very agitated because I forgot the name of the God and so started crying. My Gopal told me to go and ask you his name" !

Deep faith has produced miracles throughout the history of mankind and in all religions. It is like a deep thought where tremendous concentration and conviction is required. It is Bhakti Yoga in its ultimate form⁴¹.

Most people have faith either in themselves, in a chosen religion, science or something else. Faith provides the ego sense 'I', an anchor. Hence it allows the rest of the mind to become free to focus on the work at hand. Thus the brain's energy is not frittered away in trying to unravel the knots of doubts. If there is no faith then we tend to question everything which results

in waste of energy and precious memory space of brain. It also results in short attention span and does not allow us to focus on any thought for a longer time. Faith provides stability and security to 'I', helps it to move forward, and hence provides purpose and meaning to our lives.

Somehow faith also reduces the fear sense since it blocks up areas of uncertainties in the brain and deep faith can possibly remove the fear completely. Fear is the greatest obstacle to happiness. It locks up a substantial memory space and hence reduces the capacity of the brain to produce deep thought. Release of the memory space by faith is the essence of Bhakti Yoga where the deep faith in God gives a tremendous feeling of security. This has also been the basis of superhuman efforts by great leaders of the world who have moved in unknown areas fearlessly and discovered great truths. Since the fear sense can be removed it is also possible that deep faith may help fight depression and may provide general feeling of well being.

Faith is always blind. It cannot be rationalized. Different people have different faiths. However one should not try to change another person's faith. Doing it is like shaking the foundation of the core belief, since it takes a long time to develop deep faith. As long as that faith does not lead to violence or harm others in any way, it should be left alone. If it helps someone achieve something in life it is worthwhile for him or her to have the faith.

Some of the most heinous crimes in the history of mankind have been committed in the name of faith. Whether it is religion, or an ism or a way of life – the result is the same since one group or people try to impose their faith or belief on others. Almost all the major conflicts world over since time immemorial are because of this imposition. This imposition of faith comes from our arrogance to control everything in the world and is a reflection of our insecurities. We should try to control ourselves, our actions and become better human beings. Once each individual becomes a better human being then it will have a multiplier effect on others who come in contact with such evolved beings. This will help make the world a better place to live.

Faith is also a great enabling force. Major efforts of mankind have been driven by faith – whether in making great masterpieces like Pyramids, Taj Mahal, great temples, churches etc. or even sending the man to the Moon. This force should be harnessed for betterment of mankind and making this world a better place to live. Hence faith should not be based on any religion or creed but should be pan humanistic and based on the belief that we can help this world by making ourselves better human beings and not by controlling others.

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11. Attributes of a Good Guru

A young boy had been observing for quite some time a medicine man who claimed to cure snakebites. He was greatly influenced by the medicine man's fame and wealth. So the boy went to him and requested that he be told about the secret of snakebite cure. The Guru (medicine man) told him to become his disciple and observe how he cures the patients. Many years passed and the young boy grew to be a man. Yet he felt that the guru never taught him the real secret of curing snakebites and most of his time was therefore spent in doing menial chores and being a servant to the guru. Finally when the guru was about to die he called his disciple and said, "Since my time is up I will now tell you the secret of snakebite cure. Remember that 90 % of snakes are non-poisonous and the patients bitten by 10 % of poisonous snakes came too late". The disciple was aghast and devastated and told his guru that this simple information could have been told to him years ago in the beginning. The guru replied "But who would have taken care of me for so many years and now you should also find a similar disciple for yourself!".

Quite a number of so called self-professed gurus are teachers not in the real sense but are mostly interested in self aggrandizement and acquiring wealth. There are large number of such people in our midst.

Disciples go with tremendous faith to such gurus for getting solace and answers but most of them prey upon disciple's insecurities. The higher the stakes, the higher is the insecurity and thus one sees mostly politicians and financial gamblers frequenting such gurus. These gurus generally prescribe to the disciples wearing of rings, talismans, holy necklaces etc. Wearing them creates even more insecurities because if by chance a ring or a necklace is lost then the wearer thinks that some calamity will befall him.

A real guru is the one who helps remove the fear from the mind of the disciple. Fear is the greatest obstacle to happiness and one of the major attributes of deep faith is removal of fear.

Most of the charlatans or so-called gurus in fact create more fear and insecurities since they derive benefit from feeding on these insecurities. The faith in a person, which creates fear and brings harm to oneself is not a proper faith and should be changed.

A real guru takes upon himself/herself the pain, hurdles of a disciple, and tries to show and lead him/her on to the correct path. This is very different from so called gurus who just point in the general direction which is akin to directions given by a passerby. A truly great guru is a rare commodity and extremely difficult to find and one is very lucky to come across such an enlightened soul.

If one does not come across a genuine guru then the next best thing to do is to think about all the great attributes of such a guru and assume that he/she resides in our heart and is helping us to reach our destination. This will provide a great faith in oneself for carrying forward one's task. Besides building the faith, the advantage of such an imaginary guru is that there is neither any commitment nor any strings attached. The famous example of Eklavya from Mahabharat comes to mind. He put the statue of Dronacharya in his compound (Dronacharya refused to teach Eklavya as he was a shudra and not a brahmin) and practiced his archery thinking that Dronacharya himself is teaching him and in the process became an extremely accomplished archer⁶⁸.

Similarly Shri Ramakrishna used to say that a luminous being used to come out of his body and teach him all the scriptures and Yoga before his physical gurus came. Ramkrishna being a highly evolved person had these fantastic and vivid visions.

Imaginary guru provides a great anchor to one's life and produces similar results as those from deep faith. Adopting such a guru also allows us to package mentally most of our worries and problems to be handed over to him/her. This process helps remove psychological knots. Mind has a powerful imagination mechanism and this process has been known to produce great faith and achievements in people.

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12. Music, Meditation and Happiness

Once the gods became very unhappy with the earthlings because of strife, wars and general anarchy in the world. They came to earth and told earthlings that they will destroy them. However, gods wanted to give them a chance so they asked them to give a single reason why they should not be destroyed. "We have produced great beings like Buddha, Christ, Mohammed, etc. who have given us great teachings", said the earthlings. But the gods retorted that maximum number of human killings have taken place in the name of religion. Earthlings then recounted the great technological inventions that mankind has produced to which gods replied that there are still some 2 billion people living in tremendous hardship and poverty despite these inventions. The reasoning and response stumped the earthlings.

Then somebody said, "We have produced great music". "Let us hear it", the gods replied. The world music including Indian ragas and compositions by Bach, Beethoven, Mozart, etc. was played. After listening to the profound music, tears started flowing down the cheeks of gods. "Enough", they said, "you have earned your freedom and right to live".

Great music affects humans and gods alike in a deep way. It calms the mind and produces a great sense of well being and euphoria. One also gets a similar experience during deep meditation and samadhi.

In the beginning was the Word. Almost all the great religions of the world talk about it⁶⁹. In Patanjali Yoga Darshan, Ishwara is defined as a special Being who is expressed by the original word *Pranav*⁷⁰. What that original word was nobody is sure though in major Yoga commentaries it is called *OM*. However, recently scientists have discovered that very soon after the birth of universe, and before anything else appeared, primordial sound waves were produced⁷¹. Probably that could be the basis of *Brahma Nad*, mentioned in Upanishads⁷². Sound has therefore been with

us through all our evolutionary process and is ingrained in all our activities. Music – a product of sound is therefore a natural outcome of this evolutionary process.

Music affects the brain at different levels. Our moods change with different types of music. However, at a very deep level its effect is similar to that of deep meditation. Probably it is the reason why all great religions have stressed music as a means for praying and meditation.

Indian classical music – one of the oldest musical systems of the world, has spiritual roots and it is traced to Vedic hymns. Most of the Indian gods and goddesses are shown carrying musical instruments. Similarly in other religions also, musical chants, hymns and other forms of music have been used since ancient times to sing the glory of God or to help focus the mind on the spiritual thoughts.

Why does music affect the brain in such a deep way and why does it help in meditation? Recent Positron Emission Tomography (PET) studies have shown that some type of music activates neural pathways similar to those associated with euphoria and reward⁷³. These same pathways are activated in response to other pleasurable activities like eating and sex, which give emotional happiness.

Similarly in deep meditation, the mind focuses on a single thought for a long time. Thus when contemplation, reflection and samadhi (together called *Sanyam* according to Patanjali Yoga Darshan) are done on a single thought for a fairly long time then it produces the sense of well being and happiness. This deep meditation or *Sanyam* helps stimulate or “tickles” the pituitary gland, which gives the feeling of well being. The exact mechanism, though, is still not understood.

When we hear soul stirring music, we again get a feeling of well being. Thus, the soul stirring music and deep meditative thought may have similar characteristics. This is the principle of equivalence. The brain therefore appreciates and absorbs the soul stirring music by creating the same complex thought patterns as those during meditation.

Similar effects are also seen for different types of music, which produce anger, sadness and other human emotions. It is therefore quite possible that neurological studies on effects of music will serve as a model for studying how brain works in general and at different levels of thought complexity. As we evolve intellectually and spiritually, we become increasingly tuned to emotionally satisfying music, since the brain becomes supple and is able to focus on a single thought for a long time. Then singing and reciting poetry may become the major activities of vocal chords with speech being their by-product!

Even when we produce a great discovery or thought there is a general feeling of euphoria, happiness and production of goose pimples. There have been many celebrated cases in history like the cry of Eureka by Archimedes when he discovered the principle of buoyancy⁷⁴. Similarly, when Einstein developed his theory of relativity, he said that getting the thought of principle of equivalence was the happiest event of his life⁶². Some music and deep meditation also produce goose pimples and a feeling of tremendous happiness. Thus music can help and enhance the activities of meditation and other creative activities.

Music can also play an important role in building a compassionate and creative society. In India, if we can continuously expose our children from an early age to the great Indian and World music then it is possible to help produce a generation of citizens who are compassionate and less violent. Music should therefore form an important part of school curriculum.

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13. Less Possessions Produce Happiness

A well to do disciple was very fond of his frugal guru who used to live in a village under a tree, meditating most of the time. The guru was a free bird and went around begging for alms. The disciple thought that if he gave a cow to his guru then he would not have to go begging for food. However the guru refused to take it saying that he was very happy with his existence and also his order forbade him to have any worldly possessions. Nevertheless after great persuasion and cajoling he reluctantly accepted the gift of the cow. The disciple was delighted and felt that he had done a great service to his guru.

Many years passed before the disciple went to the village to see his guru for some advice. Not finding him under his usual tree he inquired about his whereabouts from the villagers. They showed him a hamlet at a distance. On reaching it, his guru rushed out from one of the huts with a stick in his hand and started beating him. "Look how you have ruined my life" the guru shouted. "First the cow, then the cowgirl and the rest followed! I cannot meditate and most of my time simply goes in running this outfit".

Too many possessions burden a person's mind and is a distraction to deep thought. Thus most of the time a person is occupied with his possessions and thinking of ways on how they should be increased. This pursuit of possessions becomes an end in itself. Similarly there is a tendency in people to amass wealth. Most of them hardly use it for their enjoyment. Majority of their time goes in amassing it and worrying about it. It becomes a way of life.

Possessions and wealth are necessary for having a comfortable life. However we should have them for our needs and not for our greed. For example a person will only wear a pair of clothing at a time so what is the need to possess hundreds of them; or one lives in one house at a time so what is the need to have a house in every city etc. etc. Similar is the case of hoarding other material goods.

Amassing of wealth and possessions come from internal insecurity of a person. This leads to an ever-increasing spiral of trying to get more money for acquiring more goods and services and leads to a corrupt and unsustainable life style. Wealth, which is not in circulation, is dead wealth and does not help anybody.

This insecurity can be reduced by trying to understand ourselves. Most of the people are afraid of trying to look deep inside themselves for better understanding. This deeper understanding gives us a perspective in life and is the genesis of spirituality-the understanding of spirit inside us.

Spirituality can also help in keeping our greed for materials and resources in check. As a person progresses on the path of spirituality his or her priorities in life change. The focus of life shifts more towards getting personal happiness through mental peace and less on material needs and desires and hence towards sustainability. Spirituality also helps make a person internally secure and humble.

Since the desire to increase possessions and amass wealth comes from the greed impulse it should be reduced or kept in check. Removal of greed can be achieved by cultivating a nimble brain via *Yoga* and *Sanyam*. The nimble brain has a tremendous processing power and hence a small amount of data is processed very efficiently to gain useful information. This helps the mind to "get satisfied" easily and helps in satiating the desire so that the person can move on. Reduction and complete removal of greed is the key to happiness and sustainability.

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14. Choices and Happiness

A jackal and a cat met in the middle of a forest. The jackal asked the cat how it would get away from a tiger. The cat said, "I know one way and that is to climb the tree as fast as possible". Then it asked the jackal the ways it knew. The jackal replied "Brother I know one hundred and one ways of getting away. For example I can go into the bush, can climb up the rocks, can hide behind the tree, can go into a hole..." Just then a tiger appeared. The cat immediately climbed a tree while the jackal pondered on which solution to use. Meanwhile the tiger pounced on the jackal and killed it.

Too many choices sometimes create conflicts, problems, and lead to unhappiness. Recent scientific and sociological studies done on large number of subjects have shown that there seems to be a direct correlation between unhappiness and the number of choices available¹⁰¹.

These studies reveal that increased choices have put a tremendous demand on the brain to make the correct decision. However the modern lifestyle based on information overload results in short attention span and makes it difficult for people to think deeply about the choices. Thus the fear of "missing out on something" is very high and creates internal insecurity. This produces a lingering feeling of not having made the right decision, produces regret and unhappiness, and sometimes leads to impulsive choice making.

Increased choices can sometimes be a driving mechanism for greed. Internal insecurity of a person together with the desire to maximize the satisfaction and benefits from the available choices leads to acquiring more and more material goods leading sometimes to buying frenzy. This leads to an ever-increasing spiral of trying to get more money for acquiring more goods and services. Sometimes it results in people living beyond their means. All of this produces an unsustainable life style.

We live in a world of choices and in coming times they will increase. Advancement in technology together with entrepreneurial spirit allows us ever-increasing choices since they help provide for our material comforts. These choices are meant supposedly to satisfy the needs and the desires of humans. However most of the times people loose track of what is important in life. Thus instead of choices helping to fulfill our needs they fuel our greed and sometimes become an end in themselves. Thus quite frequently a person gets satisfaction on winning the race for maximizing his "choices" rather than using them to satisfy his needs. However if we make our decisions based on our needs and not on our greed then we can become happier and can produce a sustainable life style.

Spirituality can help in keeping our greed for materials and resources in check. As a person progresses on the path of spirituality his or her priorities in life change. The focus of life shifts more towards getting personal happiness through mental peace and is less on material needs and desires and hence towards sustainability. Through the practice of Yoga and spirituality a person can produce a powerful and nimble brain. Such a brain has the mechanism of processing the choice information very effectively thereby getting satisfied easily and hence automatically limiting the choices. Spirituality also helps make a person internally secure and humble. Thus he looses interest in showing off thereby helping him to make choices which satisfy him easily.

A reduction in buying of goods and services may also affect the sellers. They may have to rethink their strategies and ultimately produce the goods for our needs. This may help curb the ostentatious tendencies and help promote an all round sustainable development and life style.

Technological progress is necessary for our overall development but more than technological progress is our spiritual progress that allows us to make good decisions on choices. Spiritual progress gives us the direction and mechanism to live a sustainable and happy life.

15. Rise up for a Better World

There is a beautiful story in Panchatantra⁷⁵. In a huge well lived two groups of frogs who were always fighting for territory and resources of the well. The king of one group who was very intelligent decided to befriend a cobra and get him into the well so that it could finish off the other group. The cobra came into the well and one by one started eating the frogs of the other group. The king was very happy with this development and felt that his aim of controlling the well and its resources was achieved. However soon the cobra ate all the frogs of the other group and turned his attention to the king's group. The cobra told the frog king that he needs food to survive and so is helpless. Despite the king's pleas and entreaties, the cobra started eating the king's subjects and family members one by one and ultimately ate the king himself!

There is a general tendency in people specially those in power to take the help of negative and evil forces to achieve their goals, little realizing that these forces are nobody's friends and have their own agenda. They destroy everything in their wake including their creator and cannot be controlled once unleashed. It is therefore best to keep away from them and they should not be played with.

Nature also destroys the negative tendencies but in a very evolutionary and positive manner. The progress or evolution of species takes place by branching⁷⁶. Hence whichever branch achieves a dynamic equilibrium with the surroundings survives, grows and prospers. The other branch, which could not get into equilibrium with the surrounding forces, simply dies off and with it that branch of the species. Thus nature evolves by making the other branch irrelevant.

This is a great lesson for all of us. If we want to put somebody down then the best way to do it is to rise higher than that person and be indifferent towards him or her. In this process the whole system gets lifted and is far superior to the one in which the person is brought down using negative forces where the whole

system loses. This has been taught in all the great religions of the world and is the basis of victory of nonviolence. However to rise up requires great courage, conviction, faith in oneself and internal security.

Sometimes when the evolutionary process goes out of hand and nature cannot control it by branching, then it removes the species violently as happened in the death of dinosaurs and wiping out of certain species by volcanic events etc. Generally such cataclysmic events are infrequent and branching mostly effects the natural process.

How can one make negative or evil forces irrelevant ? Patanjali in his Yoga Darshan recommends that one should show indifference to these forces⁵⁸. Thus by not opposing the negative forces but by being indifferent to them and acting positively we can make the system evolve so that these forces become irrelevant and die their natural death. Similarly one should not think negatively about others even if they have harmed us because the very act of thinking about a negative person brings his/her negativity to our mind. Thinking deeply is a two way street. We can send thought packets as well as receive them whenever our minds are anchored to the object of perception. In fact the very act of perception means that the information packets from the object of perception will be received. The same applies to thinking about somebody's mind.

Human beings also have tremendous propensity to humiliate other humans. We seem to get pleasure in bringing others down and in seeing them in misery. This is a general human tendency though this world is also full of examples of great people like Edison, Ford, Faraday etc. who have produced great inventions to remove the misery of humans and make the life of mankind better. Similarly the humanitarian work of Gandhi, Christ, Buddha etc. has also helped mankind.

Nevertheless the tendency to create miseries for others could be traced to the evolutionary process. In order to gain control over resources it was necessary to remove the competition and pulling down others and humiliating them could be a part of this

process. However if we realize that by reducing our needs and becoming spiritual we can become better human beings then we do not need to control others and create conditions to fight for the resources. This world can therefore become a much better place if we make ourselves better by rising above others and pull the whole system up.

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16. Natural Evolution and Happiness

In a riverbed were two trees. One was the mighty banyan tree and the other was a thin bamboo reed. The banyan tree used to poke fun at and deride the bamboo. "You are spineless and cannot stand for your rights. Look at me. Not only am I tall and stand erect, I also give shade to the wary and my tentacles allow me to spread myself far and wide", it would say to the bamboo. In the rainy season a great flash flood came. The mighty river's force uprooted the banyan tree while the bamboo simply bent with the current and when the floods receded it became erect again. This story is normally told as an example of humility. Bamboo was humble, it bent and survived whereas banyan was haughty, arrogant and refused to bend and hence was uprooted. However there is another great lesson in this story - that only those systems that come to equilibrium with the surroundings survive.

Evolution of natural systems normally takes place via branching. Thus all species whether plants or animals branch out at a certain time in their evolution. This branching takes place when the system goes far from equilibrium or "becomes unwieldy", and is governed by laws of non-linear thermodynamics.

The branch which comes into equilibrium with the surrounding forces survives and prospers whereas the other branch simply withers away. This is the basic theory of survival of the fittest since the evolutionary branch, which can withstand and weather the elements survives.

Coming into equilibrium with surroundings also means actively interacting with surrounding forces like sun, wind, atmosphere and gravity. A system can only interact with the surrounding forces when it can sense them. Thus natural systems have developed mechanisms for sensing all these elements and hence have temperature, humidity, solar (light), chemical and gravity sensors.

By following the natural evolutionary mechanism it is possible for us to become happy.

Most of the time we are not happy because of conflict within the self or with the surrounding forces which include people and environment. In order to resolve the conflict or come "in equilibrium" we should be able to sense our surroundings. The first mechanism for achieving happiness is therefore to become acutely aware of the surroundings and the corresponding forces. This means that one should develop a sensitive mind and increase one's awareness. Both these are produced by making our minds powerful through Yoga. A powerful mind is a great information processor and hence can process signals and information from the surroundings very efficiently. Without awareness the interaction with the forces is only a one-way affair i.e. we are controlled by them.

This enhanced awareness also helps us become non-violent towards nature and our fellow human beings because we can start understanding the other person's point of view. Similarly it also gives us strength to make others aware of our point of view. This is the genesis of compromise or coming in equilibrium with the surroundings. If we approach a conflict, which could either be internal or external, in the spirit of compromise, then it has a mechanism to elicit a corresponding sentiment from the other person. This results in conflict resolution. Compromising nevertheless is not an easy process. It requires a great courage and a very high quality of thought to produce compromise formulas since a viable and an acceptable solution has to be provided. Gandhiji had made this compromise process into an art form and it was the reason for his great success in finding solutions to difficult problems.

This ability to compromise is the second mechanism of achieving happiness. Without the process of compromising, the evolutionary path will be based on conflicts and may end in all round destruction of both people and environment. This is the path that is being presently followed by our civilization. Hence conflict resolution through the mechanisms of awareness and compromise can produce true sustainability and eventually happiness.

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17. Free Will, Evolution and Chaos Theory

Most people's belief falls into one of two categories. Some believe in fate and say that everything is ordained by God and we can hardly change anything. There are others who talk of free will i.e. whatever we are is because of our actions or Karma. I think the reality is somewhere between these two beliefs.

Shri. Ramakrishna the great saint of Bengal used to give a very insightful answer to the question of fate. He gave an example of a cow tethered to a pole with a long rope attached to her neck. He said that the cow feels she is free to roam anywhere but the perimeter of the area in which she can move is fixed. Shri. Ramakrishna said that similarly every human being has a free will but the length of rope is governed by God.

This example has a great parallel in the modern science of chaos theory. Chaos theory shows how life evolves from a seemingly chaotic situation. A classical example is the development of convection currents in water when it is heated in a utensil⁶. Heat provides energy to each water molecule, which darts around at random and in chaotic fashion all over inside the utensil. However, after a certain time a band of convection currents develop in which the heated water molecules rise up and are replaced by cold water molecules. This band is like a tube or a structure through which the water flows. Thus the seemingly chaotic behavior of water molecules is converted into an orderly structure. If the heat is removed, this structure collapses. This concept was explained in details in Chapter 1.

In the same way life which is an ordered structure evolves from seemingly chaotic molecules inhabiting our planet earth. This analogy can also be applied to humankind where all of us lead our own separate lives which "darts" randomly depending on the forces acting upon us and yet collectively we go forward in a band which is called human evolution. Thus we have our free will, but are tethered to this band of evolution similar to the cow in Shri. Ramakrishna's example.

Does this mean that whatever we do is meaningless since we will always have to act within this band of evolution which will occur regardless? The answer is no and again the example of water convection will help.

The convection currents are dependent on both the quantity of heat and the speed at which it is transferred to the water. The convection currents do eventually form in heated water but are speeded up by the amount and velocity of heat transfer.

Thus the evolution of mankind will also take place anyway. However by our proper actions we can speed it up. That is the advantage and value of free will.

What is human evolution? I think the goal of all human beings should be to live a long, healthy and emotionally fulfilling life. This type of life can be achieved if we make his planet a very sustainable place to live in. We can do this by our free will and by all of us working towards the goal of planet development.

This earth is the only world we know and have. This is our hell and heaven. Unless we master the technology to leave this planet's gravitational field on a large scale, this will be the home for majority of people for many generations to come. Thus the sooner we make it a very hospitable place which is sustainable, environmentally pleasing and where everybody is happy and lives a meaningful life the better it will be for us and the future generations. Our free will can speed up this process.

The life and evolution on the plant earth (just like convection currents in water) is governed by energy. All our energies either in past, present or future have and will come from the sun. All the biota, fossil fuels etc. are solarly derived. Our fossil fuels are solar energy embedded millions of years ago whereas our green trees and plants are present solar energy. Hence our evolution is governed by the amount and intensity of sun's energy. We get about 16,000 times more energy from the sun than what the mankind presently uses¹⁰⁵. This energy therefore sets the limit on our evolution.

The ultimate evolution of mankind will therefore be based on using solar energy directly just as life has done through millions of years and to run our industrial life style on it. Thus the faster we get on the direct solar economy, the faster will be our evolution.

18. Presence of a Great Soul

This is a story told to me by my father's friend about Mahatma Gandhi's presence. Apparently a well-known author of Allahabad used to write all sorts of stories in local newspapers about Gandhi's sex experiments¹⁰⁶. Gandhi felt that probably the author had not understood these experiments and so he informed my father's friend that he would be happy to meet the author and clear up his misunderstandings. A word was therefore sent to the author about the meeting and a 30-minute meeting was set up in Delhi. The author prepared a four page detailed questionnaire about Gandhiji's sex experiments and came to see him. Gandhiji enquired about the well being of the author and his family and suggested that he being such a good author should write on Raja Harishchandra and other great Hindu mythological figures! Half an hour's time of interview got over in such small talk. After my father's friend and the author came out of the meeting, the friend asked him why he did not ask those questions he had so carefully prepared. The author replied that he just could not bring himself to ask them in Gandhi's presence!

Similar is the story of Einstein's presence. In the U.S. University system people do not stand up when a famous professor or a Nobel Laureate comes into the classroom. However anytime Einstein attended a seminar or a lecture the whole audience stood up in pin drop silence – a rarity on Princeton University Campus²². People just felt his presence and felt a reverence to him.

Presence or aura is a radiation of thought that a human being emits and is felt by everybody who encounters that person. The presence could either be evil, spiritual or simply pleasant and is an outcome of a very powerful mind. It cannot be transmitted by any known technological means like video, internet etc. The day we will be able to project or transmit the "presence" to large distances through our technology will be the day when man-machine interface will vanish.

However in order to feel the presence one's mind should also be sensitive to the feelings. A person devoid of any sensitivity

cannot feel a presence. Mind is both a receiver and broadcaster of strong thoughts and it is these thoughts that allow it to feel a presence.

Nevertheless a sensitive mind is sometimes a curse because it can get distracted easily by any strong thought that it perceives. It requires a great will power to ward off influences from a powerful mind.

We also sometimes hype ourselves into a state of awe in presence of a well-known personality and do not see the flaws in that person. This hype is however sensed by these well-known personalities and they get an added boost to their energy levels. Many orators and public figures have commented on this.

However a genuine feeling of warmth, love, kindness and humility can only be felt when in presence of a great soul. Thus if all of us follow our basic gut feelings and come in contact with such souls then we should be thankful for our luck. Such people's friendship should be cultivated and cherished. I also think this is a good way to judge a person's greatness and if we follow this prescription then the world will be a better place to live in.

It is not necessary that only so called "god men" or well-known figures have a presence. Quite a number of times one can find such a presence in ordinary people. In fact sometimes well-known persons are very troubled people. Their stakes in power, position or money are very high and higher the stakes are, higher is their insecurity. They therefore radiate this insecurity which is quite unpleasant.

One can create a benevolent "presence" by developing a calm mind. Calmness of mind comes from internal security, which is an outcome of spirituality. A person who is at peace with himself/herself can radiate a tremendous calmness. This radiation of thought helps create calmness in most people who come in contact with such souls and was the basis of our Mahatma Gandhi story.

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Spirituality, Technology and Sustainability



19. Using Technology for Spiritual Progress

There is an anecdote about Shri. Ramkrishna, the great saint of India³¹. A disciple came to him and told him that after 20 years of tapasya he had mastered the art of walking on water. To this Ramkrishna replied "Fool, you have wasted your life. I can do the same thing by giving a paisa to the boatman!" Shri. Ramkrishna - a great spiritual person, who himself possessed immense yogic powers, understood the value of technology for easing the drudgery of life and hence his rebuke.

Even in Patanjali Yoga Darshan, 55 out of a total of 195 Sutras talk about powers that can be obtained through Yoga¹. Basically they are about how a Yogi can make his body powerful enough to overcome the impediments of nature, something that we do with technology. These powers are supposed to help him in the path of spiritual growth.

Technology helps humans by making their life easy so that they can focus on larger and more important issues. Surely humans have also used technology for killing other humans and in other non-productive uses. Similarly the powers obtained by Yogis in ancient times have also been used to kill. There are a large number of such examples in Mahabharata and the amusing story of Bhasmasur also shows the same thing⁷⁷. Yet the power of technology today helps us to be connected via World Wide Web, to fly at will round the world and generally to get most of the things required for creature comforts.

In ancient times it was a tradition in most cultures to renounce worldly comforts and immerse oneself in meditation for spiritual upliftment. Only a very few great souls succeeded in doing it. Thus the world produced spiritualists like Buddha, Christ, Mahaveer, Shankaracharya etc. but with technology and Internet it may be possible to produce thousands of Buddhas, Christs etc. Recent scientific evidence suggests that human beings are wired to think about spiritual matters once their basic needs are met¹⁸. I

feel that technology allows mankind to take care of its basic needs so that a large number of people can focus on higher and spiritual matters. It also allows very rapid information dissemination, allows debate and hence facilitates the understanding of higher thought.

In coming years technology will allow us to be interconnected so widely and deeply that the international boundaries and differences will melt away. Even today because of the internet we are getting more and more connected and can feel almost instantaneously, the emotions both good and bad about the unfolding events anywhere in the world. It also helps us react to them both individually and collectively and this process may help in evolving a more democratic system world over. Thus a great thought or an invention can be rapidly transmitted, debated, tested and assimilated much faster than previously.

Technological progress also unravels a lot of hidden areas and shows how nature performs its miracles. In doing this, technology helps us understand the power and greatness of nature. For example humans felt that they had invented and developed fibre optics. However, scientists have found that the root systems of plants are excellent optical fibres – something that has existed in nature for millions of years⁷⁸. This knowledge could only come once we had enough technology for creating fibre optics, lasers etc. Similarly a new science of “copy the nature”, is developing where we are finding that nature, which has billions of years of headstart, has far better answers than we have produced and hence dawning of realization that our technological progress will take a quantum leap by copying nature’s designs.

Thus as we progress in the technological area, we will discover the great laws of nature and ultimately God. For God is nothing else but this marvelous Universe which follows its own scientific laws. Spirituality is nothing else but understanding ourselves and the laws of universe through the tools of science and technology.

In coming years mankind might follow the maxim “first conquer the earth and then space”. Naturally there are many attempts by advanced nations to go into space but these attempts

are like the few spiritual leaders of past. Mankind as a whole can make a large-scale attempt at space exploration, only after achieving great technological progress. Thus I feel that when mankind starts the intergalactic travel it will become a very great technological civilization which will also be spiritually evolved. There will always be a section of the race, which will try to use the technology for achieving their ulterior motives, and for harmful purposes. But on the whole the technological progress will follow the bell curve, where the majority of mankind will use the technology for its betterment⁶⁷.

There are quite a lot of people who talk of technology as something of a hindrance in the path to spirituality. This is mostly true of fundamentalist groups all over the world. I think they understand neither technology nor spirituality. Technological progress is a natural evolutionary process for mankind and even if we wish it away it will go on. Similar is the case with spiritual progress. Only those societies that are technologically advanced will also become spiritually advanced. Therefore a necessary condition for large-scale spiritual progress is to have technological progress.

We feel and enjoy this world through the sense organs of our bodies. Getting a human body is the most important gift to the soul. Almost all technological interventions are to enhance this sense-world interaction. In coming years technology will provide us tools to create a much more hospitable planet in which majority of mankind will be able to live comfortably. It will help us repair our bodies and produce designer drugs which will make us live longer with less disease. In fact the whole basis of Yoga according to Patanjali is to make the human body fit for spiritual experience. Our future medicines will allow us to do it. This increased level of physical comfort will allow us a quantum jump in our quest for spirituality.

Nevertheless the next biggest challenge for mankind is to enable two billion people, who live in conditions of utter poverty, become part of this technological revolution. They cannot think of spiritual matters, since their basic needs are still unmet. It is not an

easy task to achieve but I feel that mankind has enough ingenuity and resources to do this. With better international cooperation in technological fields it will be possible to provide very efficient and economically viable technologies to developing world. How many years it will take we do not know but I feel optimistic that it will eventually be done.

Today far more people than ever before believe in life after death, in spiritual matters and in extrasensory perception. Popular poll after poll has shown this trend all over the world. I believe this has only come about because of the ability of human beings, through technological progress, to research these areas. For example we can now map the brain with the latest tools of MRI and can even "see" what the brain is doing in a heightened state of spiritual experience. Similarly we can peer through extremely sophisticated telescopes to see the unfolding of the great drama of galaxy formation. It fills us with awe and amazement. Thus we are creating the building blocks of the laws of spirituality by poking deeper and deeper into nature with technological tools.

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20. Nature Conservation + Spirituality = Sustainability

One of the sad effects of progress is destruction of environment and with it the nature. Large-scale deforestation, pollution of air, introduction of toxic chemicals in rivers and oceans and general march of our present technological progress is depleting biodiversity. American heritage dictionary defines nature as "The order, disposition and essence of all entities composing the physical universe" or in essence the biosphere. Some critics of environmental movements contend that if some living species do get annihilated due to our activities, it is all right since we are still part of nature. They also contend that our technological march is an evolutionary process, which automatically allows reduction of biodiversity. Their argument may carry weightage if our technological progress is environmentally sustainable but at present we do not understand all the natural forces surrounding us and hence we are not working in tune with them. Eventually we may, but till that time we need to conserve nature and biodiversity. Hence we should be concerned about nature's destruction for if we destroy nature we will lose valuable genetic information and with that a possible mechanism to evolve efficiently and sustainably.

How Nature Helps Us

Nature provides us direct benefits and without it we will not be able to survive. Majority of medicines presently in use and all our foods are derived from plants and animals. The cost of over-the-counter drugs from plants alone has been estimated to be about Rs. 3950 billion or US\$ 84 billion worldwide (1US\$=Rs.47)⁷⁹. Yet a tiny fraction of biodiversity has been utilized in the allopathic medicines. Similarly in 1997 an international team of economists and environmental scientists came out with a figure of US\$ 33 trillion for all ecosystem services provided by natural systems to humanity free of charge. This amount was more than twice the

total GDP of the world⁸⁰. Ecosystem services include regulation of the atmosphere and climate; purification and retention of fresh water; formation and enrichment of soil; nutrient cycling; detoxification and recirculation of waste; pollination of crops and the production of lumber, fodder and biomass fuel. Even if by magic we get the necessary technology and this much money to provide these services, the physical task will be nearly impossible to accomplish it thereby proving the superiority of natural systems over manmade ones.

Besides providing ecosystem utilities, nature also provides us knowledge for our future science and technology. Nature has had billions of years of head start and hence it has evolved through infinite permutations and combinations of designs. Since our brains are a product of natural evolution and earth time, it can be conjectured that we cannot think more than what already exists in nature. Thus the fastest way for us to progress is to copy nature. For if we destroy nature we will be robbed of the design template for our further development.

There are large number of examples where we have benefitted from copying nature. Presently the new mantra in the design world is biomimicry. Thus better fluid dynamic foils by mimicking dolphin swimming; better insulation by studying polar bear's fur; better design of helicopter by observing bumble bee flying and better light bulb by understanding the firefly luminescence etc. are among innumerable examples that are being researched all over the world. In fact there is hardly any modern invention which does not have its counterpart in nature. Sometimes we do not have the necessary tools to probe nature to find out how it works and thus foolishly think that we have superior technology.

Our ability to feed the world will also come from copying the natural genetic manipulation of the species. Thus the modern tools of biotechnology and genetic engineering will be used in producing higher yielding crops which use minimum of inputs of chemical fertilizers and pesticides. Our ability to mimic the natural process at molecular levels (nanotechnology is a prime example) has just started and we are still scratching the surface.

Out of 10 to 100 million species on this planet earth we have only discovered about 1.5 to 1.8 million⁸¹. Just to duplicate the complexity of biological life and interactions of organisms will take millions of years to perfect. Hence the best thing we can do is to copy the natural designs, live in harmony with nature and evolve with it.

Since we have evolved with other life forms our brains are wired to enjoy the beauty of nature. No manmade systems can compete with the joy and well being we feel in observing the infinite variations of nature's display year round. There are large number of studies all over the world which have shown that subjects recover rapidly from physical stress when they are exposed to pleasing natural environmental conditions⁸².

Similarly walking in forest under a thick tree cover is a very pleasing and emotionally satisfying experience. Besides it appears that trees might act as antennas for Universal Thought. Gautam Buddha got his enlightenment under a Banyan tree and so did Ramkrishna who used to meditate at night under a similar tree. Thus the forest provides balm to our eyes, green lungs to our planet and source of inspiration to our soul. This could have been the basis of sacred groves around temples. Thus nature is very important for our intellectual evolution and emotional well being.

Conservation of Nature for Sustainable Living

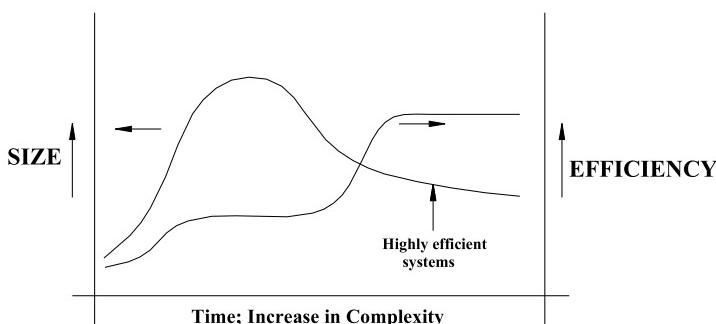
Yet the fact remains that we are destroying nature with our wasteful lifestyles and our burgeoning population. We use natural resources very inefficiently since we want to change things rapidly possibly within our lifetimes. Because of our technological superiority we are changing the natural tapestry, have started playing God, and have this arrogance to change everything in one lifetime.

Besides we still do not understand the complexity and beautiful designs of the natural systems. As we evolve in our science and technologies we will understand nature's wonders and may become more tuned to it. Thus rather than exploiting

resources like oil and gas which took millions of years to produce we will produce innovative renewable energy technologies with cycle times of 10-15 years. This may include fuel cells powered by liquid fuels from biomass, efficient biomass based power systems, solar and wind energy units⁸³. Researches world over do point towards this strategy.

Our present lifestyle is untenable. Estimates are that, at present level of technology, for all the world's population to have wasteful lifestyle of U.S. will require about 4 more planet earth⁸⁴. Obviously it has to change so that it becomes sustainable and more emotionally rewarding.

The new lifestyle can be based on decentralized development. A hallmark of evolution of a system is its size reduction; increase in its complexity; increased efficiency of materials and energy transfer through it; and equilibrium of system with forces surrounding it. As systems evolve they become extremely efficient energy and materials transformers. Just as dinosaurs became extinct and were replaced by human beings and other small and highly evolved compact life forms, our big and sometimes ugly cities will be replaced by smaller more compact rural communities. All design evolution process follows the size reduction as depicted in figure below. Our technological designs are also doing that. Thus our computers, phones, power plants etc. are becoming more efficient, complex and compact. Similarly our energy production systems will also become smaller and more efficient to take advantage of locally available diffuse natural resources like solar, wind and biomass.



It is quite possible that the evolutionary model for our society could be rural based. It will be driven by very advanced technologies so that it will be able to feed and create for its inhabitants goods and services from the raw materials available to it in its geographical area. With the availability of Internet, desktop manufacturing, small renewable energy powerpacks, genetically modified food and other advanced technologies being researched in laboratories all around the world, it will be possible to have a sustainable development.

Sustainable development can be defined as a process in which we use recyclable materials, resources and energy for our needs in an extremely efficient and environmentally sound manner. This process can be facilitated by advancement in technology.

A recent study done in India showed that for a community size of Taluka (equivalent to a county in U.S.) all its energy demand of electricity, liquid and gaseous fuels could be met by judicious use of locally available biomass resources. With provision of large-scale employment generation, Taluka model provides critical mass for sustainable development⁸⁵.

Spirituality and Sustainability

However all the development models will become untenable if we do not put a cap on our greed for materials, resources and energy. Present economic models are based on increased consumption and encourage greed. Ever increasing choices available to an average person fuel the greed impulse since the fear of missing out is very high. Spirituality can help in keeping our greed for materials and resources in check and sustainable development can only take place when we use the resources for our needs and not for our greed as Mahatma Gandhi once said.

Spirituality is the state of mind that makes it understand that the Truth is beyond the barriers of worldliness, caste, creed, race or geographical boundaries. It is universal in nature and a great spiritual thought is a cause of celebration for the whole mankind. It connects us to Universal Consciousness and gives a certain perspective in life. As a person progresses on the path of

spirituality his or her priorities in life change. The focus of life shifts more towards getting personal happiness through mental peace and is less on material needs and desires and more towards sustainability. Recent examples of Mahatma Gandhi and Einstein have shown that with very few needs and living very simple lives they were able to produce the highest quality of thought.

Spirituality also helps us have a compassionate view of nature and as we evolve spiritually we become more tuned to it which helps us in preserving it. Besides it helps us live in harmony with each other and enables everybody to work together for the common good. Also in all religions the respect for nature is preached and the maxim of simple living and high thinking is ingrained.

Nevertheless the clock on technology cannot be turned back. It is an evolutionary process and as we advance technologically we also become more spiritual, since technology helps us in doing things more efficiently and thus our needs are satisfied with less quantity of materials and energy. This allows us to think and reflect on higher things in life. Eventually we will follow nature where all the processes are carried out extremely efficiently with few materials, in minimum number of steps and at room temperatures⁸⁶. **Thus a combination of high technology together with spiritual growth will be a new paradigm of sustainable development.**

How can we do it?

A change in mindset is necessary for sustainable growth. The best way to do it is to teach children in schools about wonders of nature and limitations of natural resources of the world. The awe that the children will feel on knowing that nature has nearly all the answers to the design problems we are trying to solve will produce in them healthy respect and love for it. Besides, the knowledge that our world resources are finite and we need to husband them carefully, will help instill in them frugal habits. This early training can have a tremendous impact on an impressionable brain and will help create a generation of responsible citizens. In this

process the role of women needs to be brought to the mainstream specially in developing world. They constitute 50% of the race and can tremendously influence the children. A program where all the scientists from the major labs are required to teach part-time in schools will be a step in the right direction.

There is also a need for international cooperation on development of sustainable and environmentally sound technologies. Two to three billion people who live below the poverty line in developing countries need to be brought into the mainstream of progress. Their aspirations for the good life have been fuelled by electronic mass media. If they remain in a state of poverty the destruction of nature will continue to take place, since developing countries are following the same nature destroying pattern of developed countries half a century ago. Equitable international cooperation in technology and resource transfer will allow the developing countries to leapfrog into modern age and help in environment improvement. The ensuing economic and social development will also help reduce the social strife in the world.

Though we human beings have changed the tapestry of nature and produced problems facing our planet, yet we have this innate ability to take corrective actions once the information and knowledge is available to us. Thus the fear of greenhouse gases, genetically modified foods, animal and human cloning can be allayed by continuously evolving technological and social interventions. The upsurge of movements around the world in the renewable energy and environmental fields attests to this fact. Nevertheless there is a need to create a spiritual movement so that sustainable development is holistically driven.

Hence it is the responsibility of all of us scientists and technologists to inform our fellow citizens about these issues in a sustained and responsible manner. This will help educate the politicians, policy makers, corporate world and environmental pressure groups so that we evolve towards sustainable living.

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21. Mahatma Gandhi: A Votary of Sustainable Living

Mahatma Gandhi not only gave us freedom but he also gave the world and us a new thought on nonviolence and sustainable living. His teachings and experiments are more valid today than ever especially when we are trying to find solutions to worldwide violence and runaway consumptive life style which is going to put a very heavy burden on the world's resources.

Through ages India has periodically given to the world a new thought. Thus Buddhism, Jainism, Yogic system, Sikhism are part of the great spiritual thought given by India. Gandhiji's message of nonviolence and sustainable living is a continuation of that long tradition.

Gandhiji was energy conservator par excellence. He lived in his ashrams (Indian monastery) without electricity or any modern amenities. His insistence on use of self-human labour for majority of needs was legendary and was usually frowned upon by his closest colleagues who thought it was anti-progress and pushing back India to the stone ages⁸⁷. Nevertheless his own life was a shining example of how with frugal living and with minimum energy needs he was capable of producing the highest quality of thought. Very few of us can live his exemplary life but Gandhiji showed that mental happiness and simple living could form the basis of sustainability. He believed that with simple living the resources of the planet earth can sustain us comfortably and his famous saying that earth provides us enough for our needs but not for our greed is extremely apt today.

Gandhiji was a highly evolved and spiritual human being. Politics came as a byproduct of spirituality and he considered it as his duty to help his countrymen and fellow beings. He was guided in this endeavor by the spirit of Bhagwat Gita's Karma Yoga, which teaches that we should do our duty faithfully and not hanker after the rewards or results. There are many instances of people who saw his glowing skin, aura, and felt the presence of

his personality whenever they came in contact with him. This is only possible for a Yogi of very high order.

My father who was involved in the freedom struggle and went to jail with Gandhiji told of a remarkable instance. In early 1940's just before the start of Quit India movement (Indian independence movement to get rid of British Rule), a mammoth public meeting took place in Allahabad. About a million people were present. Gandhiji was late for the meeting. All the great leaders of independence movement were giving their speeches and trying to calm the crowd which was quite restless. Then suddenly Gandhiji came, climbed on the dias and put a finger on his lips. A wave of silence swept the grounds starting from the dais. My father termed it as a remarkable experience of the power of a small frail man over the masses.

Sometimes Gandhiji carried his energy conservation experiments too far. His experiments on conserving his sexual energy proved quite controversial. He was obviously following the age-old tradition of abstinence that yogis practice. Thus when at the age of 70 he had a wet dream he felt that his world had collapsed. He wrote about it and said that he felt ashamed of himself⁸⁸. Recent scientific evidence however has shown that our brains are full of sexual chemicals, which help in memory improvement and general well being⁹. It is therefore possible that the practice of abstinence was followed intuitively by yogis to conserve these chemicals to enhance their brain quality, which would help them in practice of yoga. More than the loss of chemicals, Gandhiji felt a lack of *Sanyam* and a loss of control over his purity of thought and hence his anguish.

As a spiritual being and visionary Gandhiji was far ahead of his times. I am sure if he were alive today he would have felt that his dream village (about which he talked often) could have taken shape with the availability of internet connectivity, desktop manufacturing and small renewable energy power packs. His dream of giving employment and decent life to rural population may become possible with the availability of these energy-efficient and high tech systems. Hence if we follow his maxim of simple

living and high thinking then it is possible to have a decentralized high tech rural society and India can again show the world a new path in sustainable living.

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22. Web of Love

There is a story that Narad Muni was once sent to the earth from heaven by Lord Indra to fetch water⁸⁹. This was also to teach Narad the lesson in powers of Maya⁹⁰. Narad on coming to earth met and fell in love with a maiden and lived with her and their children for 12 years, before he had a revelation regarding his true identity. He went back to Indra who told him that he was gone only for ½ an hour of heaven time. That was Indra's relativity !

Similarly Adi Shankaracharya was once engaged in a debate by a Mishra couple who challenged him that being an ascetic monk he does not know anything about love and householder life and concerns⁹¹. He was stung by the criticism and decided to learn about it. He left his body by yogic powers and entered the body of a recently dead king and enjoyed the company of his beautiful queens for many years and would have continued to do so before his friends brought him back to his "senses" and his original body. He understood the power of Maya first hand !

In every religion getting into *Mayajal* or web of love is frowned upon. They all insist that renunciation, breaking of bonds etc., frees the soul for ultimate salvation and liberation. But liberation from what ? All religions insist that we should liberate ourselves from the human bonds so that we can become free and merge into Universal Consciousness. Some religions even preach that after death one reaches heaven where all the goodies are available round the clock for ever ! But isn't this earth of ours that we call home with all its happiness and pain a part of Universal Consciousness?

What is the basis of such teachings in almost all religions? First of all most of these religious teachings are of very ancient origin and were produced at the time when the humans lived in stone ages with hardly any technological achievements. Hence some felt that it was better to give humans the opium of better after-life so that they could be used as slaves for few masters without grudging or questioning. This could be one of the explanations.

The other explanation could be that as life was evolving on this planet earth there were visitations in spaceships by human-like forms from advanced civilizations of different planets and worlds. These could also be Gods of ancient times. These aliens came to colonize this virgin planet. As they settled they multiplied among themselves and may have even mated with the evolving humans on this planet. The purity of race might have become an important factor at that time and may have been the basis for racism in humans. The Indian caste system could also have been the result of this desire to keep the purity of race and hence the notion that we are one of the oldest civilizations of this planet earth maybe true⁹². Though the aliens stayed on earth but the planet of origin or home must have been heaven and primitive life on earth as hell. This could have been the genesis of heaven in after life. Since they came from a very advanced civilization it is quite possible that they must have made the conditions of life on their planet very sustainable and pleasant.

I believe that as we expand our technological frontiers we will also make this earth a very hospitable and sustainable place to live in and then will colonize or visit other planets. We then might call earth a heaven in comparison to some other planet that we might visit, where life maybe in primitive state of development. It is therefore important for all of us to contribute according to our capacity to make this planet a hospitable place. Thus our personal evolution and our contributions to the society should progress simultaneously.

This desire of the aliens to go back to the parent planet might also have been the origin of practice of preserving the dead bodies. Thus mummification in Egypt and burial of dead in other cultures was the mechanism to preserve the bodies till the arrival of spaceship from the parent planet so that the bodies could be resurrected and taken to it. The memories of that planet must have been strong in the genetic code of early humans. However as the time passed this became a ritual handed down from one generation to the other. I feel in future as our genetic material undergoes transformation we will slowly forget these customs

and rituals and evolve ones, which are based upon the realities of this world.

Energywise it becomes very difficult to get out of the gravity of this earth. Yogis have said that by willing one's own death, one can use the gravity of sun and moon to help the transmigration of soul to other worlds. For example Bhishma Pitamah in Mahabharata stayed on the prickly arrow cot for about six months before he left his body by will at winter solstice³⁵. Similarly Swami Vivekanand studied the almanac thoroughly before deciding when to leave his body³⁶. They obviously understood the effect of gravity on human thought and memory (soul).

This process of soul guidance by gravity field is an efficient way for knowledge seeding of this world and may explain the birth of great masters like Buddha, Christ, Ramkrishna, etc. Probably these souls came from advanced civilizations. For these superior beings the knowledge of planetary movement must have been important and could have led to the importance of astrology. Later on it degenerated to seeing the effects of planets on an individual's life and does not have any scientific basis.

Leaving the earth's gravity field after death can be done by very few enlightened souls. Most humans become residents of this planet earth both in bodily and ethereal forms. Probably in ancient times humans could get out of the gravitational field of earth through the practice of Yoga because of the superior genetic make up of the aliens from advanced civilizations. However as our genetic material got mixed with evolutionary life forms of this planet we might have lost the ability to achieve those commanding heights. Shri. Ramkrishna used to say that the Yoga of Kaliyug is Bhakti because other Yogas like Raja Yoga etc. are difficult to practice and may require super human efforts⁹³. For ordinary people Bhakti Yoga is an easy way out. Maybe he understood intuitively the genetic process of evolving humans.

However as our technological achievements advance we will be able to develop spaceships which may overcome gravitational fields of the planet earth much more efficiently than those of today. Then we will be able to travel to other habitable planets

with our bodies. This is how the ancient gods in their spaceships might have visited this planet. All technologically advanced civilizations probably are similar.

As the numbers of humans have increased on this planet earth, the web of love and human bond has become stronger. We should realize that this planet earth is our permanent home and is all that we have and this is both heaven and hell. We are all part of the web of love of this planet, and there is nowhere else to go. If we take this view then we will change our thinking so that we do everything in our power to make this planet a very pleasant place to live. We will then stop over exploiting it, killing our fellow humans, plundering the resources and help make it possible to achieve technological advancements for intergalactic space travel. We should therefore try to create a sustainable and happy world for all our future generations because most of us will be born again and again on this planet.

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23. Flying as a Spiritual Experience

On 17 December 1903, Wright brothers in U.S. became the first human beings in recorded history to have a sustained flight in a manmade machine. Similarly in 1903 a Russian schoolteacher Konstantin Tsiolkovsky had suggested for the first time the use of rockets for space flight⁹⁴. However it was only in 1926 that Robert Goddard in US fired the first liquid fuel rocket that set the man on the path of space exploration⁹⁵. In the last 100 years our technological developments have been rapid and thus we have been able to send the man to the moon, been able to jet across our planet earth and there are indications that one of the space probes Voyager, launched 26 years ago, has reached the edge of our solar system some 13 billion kilometers away. From this distance the radio signal takes more than one hour to reach the earth.

Since time immemorial man has dreamt of flying and reaching the stars. In all mythologies gods are shown to have powers to go to any place at will. In Patanjali Yoga Darshan it is stated that a yogi can get, through spiritual practice, the powers to fly through space with speed matching that of the mind⁹⁶. Mahabharat and Ramayan have references to flying machines and in other societies also gods have always been portrayed as shining beings coming to earth from space. Almost all our scriptures talk about liberation from this planet earth and urge us to go to higher worlds or *Swarglok*⁹⁷.

Hallmark of evolution is motion and increasing speed of motion. As we progress in our technological developments we will produce spacecrafts which will allow us to fly efficiently both on this planet earth and intergalactically at very high speeds. Our brains are somehow wired in such a way that we feel exhilaration in overcoming the gravitational field of earth. Thus people with an out of body experience (OBE) have reported spiritual experiences of flying at will and getting away from the gravitational pull of earth. Similar experiences have been reported by people who practice hang gliding⁹⁸. They talk about the thrill of flying silently almost like a bird. Our future technological developments in

space travel may allow us to travel at will in intergalactic space and help us experience the awe inspiring sites of galaxy and star formations while still possessing our bodies.

Almost all the astronauts who have flown over the earth talk about the beauty of blue earth in spiritual terms. Similar was the case for moon landing. The dark background of the sky with sun shining on the moon surface was described by many astronauts as incredibly beautiful⁹⁹. Flying over snow-covered mountains, green fields and forests is also very pleasing to the eye and shows the beauty of mother earth from close quarters.

Human beings have always reacted with awe and goose pimples when observing the powerful forces unleashed either by man or by nature. Thus Robert Oppenheimer the father of atom bomb described in almost spiritual tones the explosion of the first bomb in Trinity in New Mexico, U.S.¹⁰⁰

Similarly when astronomers peer through their telescopes and instruments and see and study the gigantic forces, which are billions of times greater than atomic bombs, shaping our universe they are filled with awe and talk of seeing the handiwork of God. In Gita when Lord Krishna showed Arjun his "Virat" form, it is possible he was showing him the galaxy formation and black hole. This awe-inspiring event made the hair on Arjun's body stand up²¹. As we advance technologically, I am sure we will travel in our amazing spaceships visiting different planets and observing first hand these great forces at work.

Thinking about stars and seeing the forces of Universe may also give us a certain perspective in life. We are like a small speck of dust in the vast Universe and yet our petty worldly matters overwhelm us. The best way for all of us to be exposed to wonders of stars and cosmos is to learn about them in schools. Hence the study of astronomy should be encouraged in all school curricula.

It is quite possible that in future we will explore space not as much for finding another home for mankind but as a spiritual experience. Then we will thank Wright brothers and Goddard for making it possible for us to fly and travel in space.

24. Virtual Reality and Nirvana

All our experiences and knowledge of the physical world are through our five senses of taste, smell, touch, sight and hearing. Together with this is our sixth sense the intuition. We enjoy the world or suffer pain through our senses. These sense signals when processed by brain give us a feeling of individuality, awareness and desires. These desires have to be satisfied and resolved because unresolved desires produce greed and create tremendous long-term psychological knots in the brain. Resolution of desires is the first step towards spirituality and reduction of greed.

Yet fulfillment of desires requires considerable investment in energy and resources and is the cause of unsustainable development world over. Modern technology of Virtual Reality (VR) may provide a mechanism to satiate our desires at almost zero cost and energy.

Virtual reality (VR) is a creation of virtual 3D world in which one can feel and sense the world as if it is real. It is normally achieved by donning a headgear. The gear contains the screen, which is attached to the computer with the necessary software so that a virtual 3D world is seen. The increasing sophistication in this technology allows the sense of touch (by wearing hand sensors like a glove), smell and hearing through the head gear. VR experience is akin to sitting and watching a film in a 70-mm film theater but with interactive process where one can change the scenes and be a part of the scenery. It allows one to get a full blast of information to the senses and hence can allow us to enjoy the world and thus satiate our desires to certain extent.

The VR process is being used increasingly by scientists and engineers for designing technologies¹⁰⁷. It is allowing engineers to design machines and engines in real time as if the actual machine is being changed. However like Internet, which was initially developed to aid scientists and technologists but came into mainstream, VR will also come into the mainstream and will be used by everybody. The technologies in VR are expanding

so rapidly that in a matter of years we will have almost real life experiences of flying, tasting objects, moving them, smelling them and even having a feel of their texture. Maybe pornography will be the first offshoot of this process! Some latest experimental VR technologies have already reached this level of sensory perception.

Even today with VR an individual at will can go to Disney World; can visit some of the finest museums of the world; or have the spiritual experience of flying to far away galaxies; or fly low over the majestic Himalayas or Swiss Alps without moving out of the VR room. Similarly he/she can do window shopping in some of the best shopping malls of the world and even try out some of the items displayed. In short a person can fulfill substantial portion of his/her desires through VR at almost zero cost and energy. With desires satiated individuals can hopefully move on to higher things in life. This may help in reduction of greed also.

Each individual needs to experience the world. That desire is latent in all humans and has to be satiated. No amount of sermonizing can stop the younger generation from trying to experience it. VR allows a least-cost (energywise) and non-invasive mechanism to achieve this objective. VR sometimes can be even more powerful than the real world since it allows almost anybody to feel and sense the otherwise forbidden world. It is possible that this satiation of desires so easily will result in overindulgence. However as the technologies of VR and experiences of individuals mature they will move on to other higher things.

VR is however not a panacea for the ills of the present day world. It cannot satisfy the real hunger, cure the diseases, and cannot substitute for real human contact. Nevertheless it may allow vast majority of citizens from developing world to enjoy the world in an interactive mode and may help them to move on to higher goals. This will help the world to move towards sustainability and eventually to Nirvana.

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25. Cloud Computing as a Theory of Reincarnation

Through ages mankind has been intrigued by reincarnation. Various theories have been provided in our ancient scriptures but most have been silent on what passes from body to body during reincarnation. Modern technology of cloud computing might help.

Just like cloud computing where most of the information for personal usage is stored in cyberspace and accessed by will with a combination of unique user id and password, it is possible that most of the deep memories of an individual, both good and bad, exist in knowledge space (KS) and can be accessed by an *avatar*.

As we have seen in Chapter 2, knowledge space (KS) is where very concentrated thoughts, strong emotions etc. are stored as memories. A very powerful emotion or deep thought is a very stable structure and hence can stay for a long time as a memory in KS. Thus KS is just like a virtual server of cyberspace.

It is possible that what transfers during the time of death is only the user name and password! If somebody wishes and has the ability then he/she can access those memories from KS. This is the basis of reincarnation. The transfer of unique ID from one body to another is by pure chance unless willed by near and loved ones. Nevertheless great yogis who have left the body by will have used the conjunction of planets to probably go to different worlds. For others this earth remains the abode for all incarnates.

Since the memories can be accessed from KS, an individual also has the ability to change them. This could be the basis of ancient philosophy of Patanjali who says that with Yoga and Sanyam a Yogi develops powers so that past birth *Sanskars* can be modified or destroyed to achieve liberation. This capability of changing deep memories in KS only exists with human brain because of its size. If the soul reincarnates into an animal body then those memories remain dormant till one again finds a human body and changes them.

Energy wise the transfer of only user name and password from one body to another makes more sense since a “switch” is easier to transfer than memories of a whole lifetime. Besides it allows us to shed the baggage of old memories and hence the new life starts with a clean slate.

Cloud memories in KS may have some subtle effect on the actions of the person possessing them. This may be the basis why almost all religions have stressed on doing good so that past actions do not come to haunt you. It is almost like whatever you write on Face book or other social network sites, always comes to haunt you. This also means that these memories are cumulative i.e. they accumulate through various births! However not all memories exist in KS but only very deep emotional ones do.

Since the user name and password is an important part of reincarnation this could be the basis of ancient tradition of child naming ceremony practiced in almost all religions where the birth name is given based on the child's horoscope.

How can we access our memories of past births? Only very advanced Yogi's with practice of *Sanyam* have the ability to find about their own or others' past births. Thus in a celebrated example Shri. Ramakrishna found out about past reincarnation of Swami Vivekananda by touching him on his chest⁵⁷.

Similarly Swami Vivekananda once described how by touching the hand of a disciple he saw all the disciple's past memories as written in black with sky as the blackboard. With his knowledge and yogic powers Vivekananda could extract the disciple's memories from all others. This is just like the cloud computing where one can access the relevant information from the servers.

Nevertheless quite a number of children have been able to recollect their past births. Their unfettered but powerful mind with correct user name and password somehow has this ability. As they grow older their present personality and identity overshadows the older one and they loose this ability.

Just as through our writings, chats and e-mails we create a profile on social networks and cyberspace, with our deep thoughts

and strong emotions we can create a profile in knowledge space. The more powerful a person's mind is, the bigger is his signature in the KS. This signature is further strengthened by people thinking about that person and hence a virtual temple for him is created in KS. This could be the basis of invocation of gods and deities practiced by mankind throughout the ages.

Similarly KS also has memories of advanced galactic civilizations and powerful minds and can help in producing new discoveries and inventions.

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26. Personal Evolution Helps Mankind's Progress

It is said that when Gautam Buddha reached enlightenment a great conflict raged in his mind for seven days. A part of the mind said, "Since you have found the truth what is the need to remain caged in this body? Get liberated!" Another part of the mind counseled "Share your knowledge for the benefit of mankind". It is this part of the mind which won in the end and Buddha spent next fifty years preaching his gospel to the world, which got enriched by his teachings.

Not only is it necessary for all of us to discover truth but it should be shared freely with others for mankind's progress. This will help make our planet a better place to live in and help improve the lives of its inhabitants.

The desire to share our discoveries with the world is normally fuelled by greed for either fame or money. Very few people have the selfless attitude to share their discoveries freely for mankind's benefit. Even people who practice philanthropy are sometimes guided by the desire for fame.

Every inventor is justified in trying to get due returns for his/her inventions but we should try to curb our greed for very high returns. This will lead to a large flow of inventions and discoveries. There is a law of knowledge. The more knowledge one shares and imparts to others, the more one becomes capable of discovering new knowledge.

Why are most human endeavors driven by fame? Even rich and wealthy people aspire to fame. It probably comes from internal insecurity. The desire to be loved and adored by other humans is the basic desire since it reinforces the work, direction and path of an individual. Fame is another name for this desire. When a person becomes completely secure he becomes very humble and the desire to get fame, name or money goes away or is greatly reduced. Then his desire to tell the truth comes from pure selflessness. Sometimes even people who are in search of

ultimate truth may initially be motivated by the desire for fame, but later all the desire to show off goes away with realization of truth.

Nevertheless greed and fame (it is also a form of greed) are necessary engines of development, for producing inventions and finding truth. However they should be put in check and not allowed free reign. The best way to do this is to cultivate from childhood the habit of deep thought. Deep thought helps one to progress towards spirituality and makes him/her a better human being. This also helps in removal of psychological knots and creates all round happiness.

We seem to always teach our children the desire and necessity to compete aggressively with other fellow beings. This competitiveness helps create insecurities. These insecurities do provide a driving force for short term bursts of inventiveness and discoveries, but in the long run prove to be counterproductive, since too much memory space in the brain is taken up by them and results in producing psychological knots. A relaxed brain, which is free of greed, can create many more inventions. Nevertheless it is very difficult to remove the greed from the human system and this trait will remain as long as humans exist. It should therefore be curbed and channeled for greater human cause.

The most important thing, which can help mankind, is personal evolution. For personal evolution we should endeavor to change ourselves so that we become better human beings. This also includes fulfillment of personal needs so that we can think of higher things. When personal needs are resolved we can work selflessly for society and mankind's benefit. Spirituality helps us become better humans. It gives us a certain perspective in life so that the focus is shifted more towards mental peace and away from material goods and greed. Once an individual becomes a better human being then it will have a multiplier effect on others who come in contact with such evolved beings. This is one of the best ways to help mankind.

After personal evolution we should strive to give back to society, either in cash or kind, according to our abilities. A simple

way to achieve this is to do our work diligently and conscientiously in whatever profession we are. This can help reduce the general lethargy and corruption in the society. The greed of most people who expect more for whatever they are doing fuels the corruption and leads to nonfunctional systems.

Sometimes by chance or fate we are thrust into taking an active role in public life and if our personal needs and emotions have not been resolved they can then create dangerous situations for humanity. This is normally the case with very greedy, ambitious and insecure leaders both in political and economic fields. History is replete with leaders like Alexander, Genghis Khan, Hitler, Stalin, Mao, Nixon etc. who were extremely insecure human beings and created havoc with the world since they had tremendous resources and powers at their disposal. In fact some of the largest number of killings and heinous crimes against humanity have been committed by the so-called leaders and messiahs who wanted to impose their ism on the world and hence unleashed forces, which were very dangerous. This misery for mankind could have been avoided if these people had been secure and decent human beings.

We should realize that this world is the only home we have. Most of us are reborn on this planet and the souls of very few super human beings can leave the gravitational field of earth by will. In future with our technological advancements we might fly to colonize other planets. But till such time it is in our interest to make this world a better place. This can happen when we become better humans and all of us work together to share our knowledge and inventions freely. With the motive of secrecy and greed for money and fame, the growth of mankind is inhibited. We will eventually evolve technologically but with secrecy it will be in fits and starts. However with all of us working in unison the rate of evolution will be faster.

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27. Youth, Environmental Improvement and Happiness¹

The future of the world is the youth and they have to carry the torch of making this world a better place. It is however the duty of older generation to show them the proper path and direction. Most of the younger generation are smart, full of energy and want to do something useful with their lives. When no role models are available then their considerable energies go into destructive pursuits. Thus in the interest of future of our world it is imperative that all of us guide the youth for better world.

I feel that when youth work for common and noble good then it brings tremendous happiness and satisfaction to them and this is the theme that we will discuss in this essay.

Why environmental improvement?

All life forms want a comfortable and happy life. In case of human beings it is a sum of two things, personal happiness and better environment.

Personal happiness can be obtained from a variety of ways. Basically one becomes happy when one is contented or at peace with oneself. We will talk about this later in the essay.

Environmental happiness is what I call community or nation building. It is the enabling environment which makes you feel happy to live in, work in and just be a part of it. This environmental happiness also gives us a sense of belonging, makes us feel proud of our surroundings and gives us a sense of ownership. If we create a happy environment for our work and living then we will make any country a great place to live. Each one of us should therefore work towards improving our immediate environment so that it becomes nice and cheerful. Then we will be genuinely proud to be a part of it. For environmental happiness and nation building we need excellent young people.

1. This is an amalgamation of various inspirational talks I have given to students at various Indian Institutes of Technology (IITs) and other premier technological Institutes in India and abroad.

How youth can help in environment improvement?

First accept that whatever we are today is because of the country and society. Hence we should give something back to the society. Gratitude is the essence of being human. I believe that the whole purpose of our existence is to increase personal and societal infrastructure. Personal infrastructure includes health, happiness and general well being. By improving our personal "infrastructure" we become better human beings and it helps in our emotional growth and evolution. By giving back to the society so that its "infrastructure" increases we help in mankind's evolution. Both these activities when carried out simultaneously can give us a great joy and satisfaction.

Most of us work towards fulfilling our basic needs. But once our basic needs are satisfied, all of us long for some meaningful existence. Even very rich are looking for some meaningful actions and purpose in their life. Happiness cannot be obtained by money alone. It only comes when there is some meaning to life. That meaning, I feel comes from helping other less fortunate people and by giving something back to the society.

We can all do this by keeping a certain portion of our time for it. Thus one should keep aside half an hour per day (only 2% of the time) for society work. It is almost 200 hours/year. This is substantial time for society and the work can add up year after year.

For environment improvement you can work on anything in which you interact with the surroundings and can help make it better. Thus work for helping needy students, cleaning the surroundings, energy saving etc. can all be part of your work for society.

Just trying to conserve energy in whatever way you can will be a great way of helping the society. Keep a daily log of the energy consumed and how you can save it. Even thinking on improving your surroundings, writing about it and telling others is society work. Similarly anything that you do within your means to help somebody else is also society work. Follow the mantra "act locally think nationally" and you will help in societal improvement.

However in all these things be very active and this activity will give you a positive frame of mind. Develop a “can do” approach. Everything is possible with a strong will and a good attitude. At young age the mind is very active and hence you should be bubbling with ideas. Best ideas are the maximum ideas. The more ideas you have the higher is the chance of producing a great idea.

Be positive in your approach. Rise above the negative things and make them irrelevant. This is how nature works. It evolves by branching out and only that branch, which interacts properly with the environment, survives and evolves. The other branch, which does not, withers away. Thus nature never suppresses the other branch – it becomes automatically irrelevant (Chapter 15). Hence never try to bring others down. Rise up over them and you will benefit by this strategy. This is a higher mode of development where the whole system is upgraded and lifted up. Learn to follow nature in everything you do specially in design. It has evolved though million of years and hence has great design templates to copy and emulate. Thus the mantra of design should be biomimicry.

Don’t worry about the outcome. Positive things will happen if you are honest and conscientious in your work. You are doing the society work for your benefit namely self-discipline and self-discovery. Besides you will also feel tremendous satisfaction in helping others. Every work you do will help you learn new things and will help in increasing your “infrastructure”. If you have this attitude then any work you do becomes enjoyable. Never say “what is in it for me”. That is a negative attitude.

What are the issues in environmental improvement?

Around 60% of our rural population lives in very primitive conditions.¹¹³ They have no electricity and their lives are in darkness. This is a sorry state of affairs even 62 years after independence. They use inefficient kerosene lanterns for light, primitive and ancient biomass cook stoves for cooking, and have no clean drinking water. Modern technology somehow has not

touched their lives. Besides the poor quality of end product, the devices used by them create tremendous health problems. Thus there are estimates that around 300,000 deaths per year in rural areas of India are attributable to inhaling smoke from the inefficient and primitive biomass stoves.¹¹⁴ Similarly lack of clean drinking water kills about 1 million children every year in rural areas.¹¹⁵

Without these people getting into the mainstream, environment cannot be improved and India cannot become an economic super power. Around 54% of India's population is below the age of 25 years and most of them live in rural areas and are unemployed. This huge mass of energetic youth with increased aspirations is the engine of development. Creation of rural-based enterprises is the best way to create wealth, improve their quality of life and bring these people into mainstream of development. Our leaders are talking about making India the third biggest economy by 2012. Unless the lives of rural population are improved this will not be possible.

I am sure you will all go and become leaders and important people in your own enterprises, in corporate, Government and other sectors. In whichever sector you go use your considerable clout to help the rural population increase their quality of life. Even if you go abroad think how you can create conditions to improve the lives of these people. This is your contribution to the society.

In order for you to understand what rural population needs and how they can be helped it is necessary that you spend some time in becoming familiar with their plight. The best way to do so is to spend a year or so with rural-based NGOs. On a selfish note I would love to have 4-5 of you spend 1-2 year with my NGO – Nimbkar Agricultural Research Institute (NARI). By spending time with rural NGOs you will achieve two things. Firstly you will understand the problems of rural India and secondly you will know how these NGOs work. Later on this knowledge may help you in starting your own NGO if you wish to do so.

You all are in the age group of 20-25 years. Spending one or two years in rural areas will hardly be noticed by you later on but the experience will be extremely rewarding and it will attach you firmly to the roots of the society. This time spent in rural areas is also your contribution to the society because I am sure that young and bright students like you will think very hard on the problems that you will encounter during your stay. And I do hope that these experiences will stay with you the rest of your life so that when you have the resources and a chance you will do something about them.

Thus some of you who will go in corporate area should think how you can help in creating rural enterprises by creating venture funds. It is my firm belief that only a very strong partnership of corporate, NGOs and local community leaders can create a vibrant and wealthy rural India. Hence your internship experience in rural India should help you later on in forging and strengthening this partnership further.

For some of you who will go into R&D think about how you can develop technologies to create better devices for rural areas and for some of you who might go in Government service a whole range of activities will be open to you for helping the rural population.

Technology intervention

In order to help the rural population improve their quality of life technological intervention is required. This is a technological age and we live in an industrial society. Whatever we do is governed by technology and thus technology plays an extremely important role in our lives. For rural areas sophisticated technology is needed. Most of the technology efforts in the past for providing basic facilities to rural areas have been based on a "tinkering" approach, meaning a small adjustment here and there, and using "low" or appropriate technology. This approach, which has been used by various agencies, normally resulted in incremental changes like development of improved chulhas (cook stoves) or better bullock carts. Tinkering, however, has barely made a dent in the quality of life of poor people.

Rural population has the same aspirations as you and I have. With increased exposure to mass media their desire to improve their lot has also increased. Thus technology intervention is required in using rural resources to provide products and services to these people. Filtering down approach of urban goods to rural areas will not work in the long run because of lack of infrastructure, resources and different rural situations.

Since the rural population wants to improve their lot, the easiest way for them to do so is to migrate to urban centers. As we all see around us this is creating great social, economic and political problems in urban areas. There are estimates that by 2050 more than 50% of India's population will be urban.¹¹⁶ Besides taxing the already poor infrastructure in cities, this migration will have far reaching consequences for food production since less people will be involved in farming.

Thus there is a need to create new type of industries which will be based on locally available renewable sources like agricultural residues, solar, wind, etc. and which will produce wealth in rural areas. This is possible by the use of sophisticated – or “high” – technology which can efficiently convert these resources and materials into useful products. This is the hallmark of evolution where natural systems evolve into very efficient materials and energy converters. In this process the system size is reduced, efficiency increases, and they become more complex. Some of our designs and technologies are going on this path. For example, computer chips, cell phones, power plants, etc. are all becoming very efficient, small in size and complex. Technology developers should follow this strategy in developing rural technologies. In fact, much more sophisticated thought and “high” technology is required for solving rural problems since the materials and energy resources available are limited and often only available in “dilute forms”.¹¹³ Thus the strategy of high technology allows maximum energy and materials to be extracted for useful end products.

I also think that as students of a premier technological institute you should work in technology area rather than management. It is the technology and its appropriate applications,

which provide solutions to mankind's problems. Only after the technology becomes available you can manage it. For rural areas the technology will not come from U.S. or Europe. We will have to develop it ourselves and some of our brightest minds should do it.

I will now give few examples where high technology intervention can provide a quantum jump in the quality of life of rural population. These examples are for lighting, cooking, energy production and provision of clean drinking water. Though these examples have been chosen but the same methodology can be used for any other area.

Strategy for lighting

The history of civilization is the history of lighting. Lighting allowed mankind to extend daylight hours and hence increase productivity and commerce. It is a sad state of affairs in our country that nearly 62 years after independence 60% of rural population are without electricity. They use simple but very inefficient hurricane kerosene lantern for lighting. Presently we know of only two methods of lighting—liquid fuel and electricity-based.

Our institute NARI has developed an extremely efficient liquid fuel-based, dual purpose, lantern called lanstove which simultaneously provides light and cooks a complete meal for a family.¹¹² This lanstove produces about 1350 lumens (lm) of light (equivalent to light from a 100 W electric bulb) and 1 kW of thermal energy for cooking in a specially designed cook stove. The lanstove runs on low grade ethanol [55-60% (w/w) ethanol/water mixture] which is easy to produce from any locally available sugar-based raw material such as sugarcane, sweet sorghum, flowers, spoiled fruits etc. This ethanol uses much less energy to produce than the regular high grade ethanol, and is a very safe mixture for household purposes since water helps as a flame quencher. Also it is a very clean fuel so no soot and noxious gaseous fumes are emitted.

Since lanstove provides light and cooking energy simultaneously (no other lighting device does that), it is about 2.5 times more efficient than electric cooking and lighting! NARI has also produced an efficient ethanol-based cook stove for bigger cooking needs for a large family.

The lanstove produces light from thermoluminescent (T/L) mantles. In developing lanstove we became acutely aware of problems with T/L mantles. These mantles mostly contain mixtures of rare earth materials like thorium and cerium oxides and their lighting efficacy is 1-2 lumens (lm)/W.¹¹³ On the other hand the lighting efficacy of 100 W light bulb is 10-15 lm/W and that of fluorescent lamp about 60 lm/W. These mantles have not changed since 1860s (they were developed in Germany at that time) and improving their efficacy will further increase the efficiency of lanstove.

Many people have tried to improve them but have not succeeded. We still do not understand how the light is produced from this oxide mixture. The 2000⁰C flame produces light as if it is coming from a 3600⁰C black body. I feel the emerging field of nano-science can help in developing materials which can glow efficiently at 1000-1500⁰C. Besides R&D is necessary in making these mantles out of sturdier materials like carbon composites, ceramic-based thermoluminescent materials etc.

Ultimately for decentralized light based on chemical fuels we should learn from nature and try to copy the bioluminescence mechanism of firefly where visible light is produced very efficiently and at room temperatures. With grid electricity still a distant dream for a majority of rural areas, efficient chemical or liquid fuel lighting needs to be encouraged.

Simultaneously, we have to explore decentralized electricity-based lighting since 100 years of R&D has gone in perfecting this type of lighting. Thus decentralized electricity generating plants in rural areas are the future. The plants could be of various sizes ranging from 10-20 MW (for a taluka) to 10-20 W (for individual usage).

We at NARI pioneered the development of strategy of 10-20 MW capacity biomass-based power plants for taluka level.⁸⁵ These plants would run on agricultural residues. India produces about 600 million tons of these residues every year. Presently they are burned in the fields to achieve waste disposal. Theoretically they can produce about 80,000 MW of electric power or nearly 50% of total installed capacity of India. Thus the impact of such power plants can be huge since they can produce electricity and wealth in rural areas and to my mind should be the cornerstone of rural development strategy.

NARI's taluka energy program became a national policy and was run by Ministry of Non-conventional Energy Sources (now MNRE) from 1996 till 2002. About 40 biomass-based plants of 6 MW capacity each were set up and the whole program had a mixed success. This was because the Electricity Act of 2003 had not been instituted and hence these plants had to sell electricity to loss-making state electricity boards. With the advent of this act where private utilities can be involved in producing, transmitting and distributing electricity, there are indications that there will be an explosive growth of such power plants all over the country.

In the range of 10-500 kW_e R&D is needed in biomass gasifier-based plants, steam engines, sterling engines, biogas-based gas turbines and even nuclear power. There is a whole array of technologies that can be developed so that they produce power from environmentally friendly and locally available renewable fuels like biomass, solar, wind etc. For young scientists and technologists this is a great technology challenge since the production of electricity and heat for useful purposes from dilute renewable resources requires extensive R&D and creative financial engineering.

On micro scale (< 1 kW_e) there are exciting possibilities for lighting. For example there are tantalizing indications that new class of materials being researched can produce 3 electrons/ photons thereby providing a quantum jump in the efficiency of solar cells. These types of solar cells together with ultra capacitor batteries (instead of regular lead-acid batteries) can revolutionize rural lighting.¹¹⁴

Similarly there has been a quantum jump in the efficiency of thermoelectric elements. These elements can be incorporated into any biomass-based cook stove and about 40-50 W of power can be produced. This power is enough to power a small fan so that the combustion efficiency of cook stove is improved and part of the power can be stored in ultra capacitors for LED-based lighting.

Work is also going on in producing 10-20 W micro-engines via MEMS process. These engines can run on ethanol or methanol and hence can eliminate the need for storage batteries. The storage of energy is in the fuel. Thus an extremely efficient decentralized lighting system can be thought of which consists of micro engine powering a CFL or LED lamp.

Cooking energy strategy

Only liquid and gaseous fuels produced renewably can provide clean cooking energy. Two fuels fall into this category. Liquid fuels like ethanol or biodiesel and gaseous fuels like biogas.

Ethanol is an excellent fuel for cooking and NARI's lanstove and stand alone ethanol stove are examples of this technology development. Field testing of ethanol stove has given very positive results and almost all the women users compared it very favorably with a LPG stove.¹¹⁷ However in order that ethanol can be used as a rural household fuel, the presently restrictive excise laws have to be modified. Thus a policy change is needed by Govt. of India in this regard.

A clean gaseous fuel that can be produced from the existing biomass sources is biogas. Biogas has been used extensively in rural areas of India for almost 100 years. However it is produced very inefficiently in fixed or floating dome systems and requires considerable amount of cow dung and other nitrogenous material. It is not suitable for a household with less than 3-4 cattle. Besides there are problems of gas production during winter and improper mixing of mixed inputs like biomass, night soil, cow dung, etc. The biogas which is a mixture of methane and carbon dioxide cannot be liquefied and requires very high pressure (> 100 atmospheres) to compress it to enable its use over extended periods.

Thus R&D is necessary in two areas. One is the development of extremely efficient biogas reactors so that the production/unit of biomass inputs could be maximized. The second is to develop appropriate storage materials which could store biogas at medium pressures.

Optimization of biogas production from a reactor requires sophisticated electronics based controls and bio-chemical engineering technology. A small utility can afford to do it whereas for a household it might be too costly. Tinkering around with existing biogas reactors will not solve the problem. A very sophisticated science and technology input has to be brought to bear on the problem for optimizing the biogas production in rural areas.

R&D is being done world over in methane storage and recently experiments have been conducted in storing it at medium pressures (< 40 atmospheres) in hydrates, porous carbon and porous organic structures. There is thus a need to develop low cost storage materials so that biogas could be stored in them for usage in households. New materials developed through nanoscience and nanotechnology can be used for this purpose. Thus a scenario can be thought of whereby a micro-utility company can be set up in rural areas which will buy locally available raw materials like cow dung, biomass, etc. and will use them in a very high tech biogas reactor to efficiently generate biogas. This gas can then be stored in small cylinders lined with gas-absorbent structures which can be transported to households in a manner similar to LPG cylinders. This will revolutionize the cooking system in rural India.

The use of high technology in lighting and cooking energy can result in considerable economic development in rural areas. Our estimates show that this energy industry can be of the order of Rs. 40-50,000 crores/year.¹¹³ Besides it can potentially create about 50 million jobs thus bringing substantial wealth to these areas.¹¹⁸

However as the course of agriculture gets dictated by increased industrial demands for fuel and electricity production there is a need to debate the food vs. fuel scenario. In that

context use of multipurpose crops like sweet sorghum becomes very relevant. From a sweet sorghum crop one can produce food (grain), fuel (sweet juice from its stem can be fermented to produce ethanol) and fodder (the bagasse and leaves are excellent fodder for animals). Thus from the same piece of land one can get all these things simultaneously. No other crop can do this. Our Institute NARI introduced this crop in India in late 1960s and was a pioneer in its development.¹¹⁹

There is also a need to develop a whole plant approach where every part of the crop is utilized for human consumption. The production of biogas, ethanol or fertilizer from agricultural residues requires extensive R&D and has a potential of converting farms into food and fuel factories. This can bring in substantial wealth to rural areas and can transform India. To my mind farm and farmers are the backbone of any nation since they can produce food, fuel and wealth from the land. Thus they should be helped both financially and technologically.

Agricultural issues

We have seen with the above examples that agriculture-based energy production has the potential of generating tremendous wealth and jobs in rural India. Thus it is imperative that modernization of agriculture takes place. Presently most of the agriculture in India and other developing countries still exists in stone ages. There is very little mechanization and ancient agronomy practices are used. The problem has also been compounded by the fact that because of land reforms in India the land holdings have reduced thereby restricting the use of existing big and heavy farm machines. In fact this farm size reduction could be a boon in disguise since it can allow precision agriculture which can reduce inputs and increase productivity and is becoming popular in western countries.

Thus very extensive R&D is required for developing efficient farm machinery for small farms. This requires inputs from very bright young scientists and engineers. Presently all the bright students opt for engineering, medicine, MBA, etc. and thus

agricultural sciences and engineering do not attract them. Even if you have done engineering in presently fashionable fields like IT, Mechanical etc. you can help by joining companies which can produce good farm machineries. This will considerably help in R&D in this sector and will be your contribution to society.

One of the major problems of farming today is that it is becoming very non-remunerative. Non-remunerative nature of farming has come about because of many reasons – the primary being poor support price by the government and resistance of the public to pay proper prices for food products. Secondly a peculiar characteristic of farming is that only 25-40% of the produce is food for which the farmer gets money. The rest 60-75% is biomass or agricultural residue which is a waste and for which the farmer does not receive anything. No industry can survive on the norms of 60-75% wastage. Thus for farming to become remunerative the farmers need to be compensated for the agricultural residues.

When agricultural residues are capable of producing very high quality energy like liquid fuels and electricity, they should be given very good price. Our estimates show that with proper pricing of these residues a farmer can easily earn about Rs. 5000-7000/acre/season by selling them for energy production.

Since farming is non-remunerative, farmers' children do not want to get into it. There is a general refrain that farming is not any more a dignified profession and that the sons of farmers are not considered "marriageable commodity"! Besides being uneconomic, farming is also hard work. By developing high technology farming equipment like small combines, harvesters, bailing machines etc., it is quite possible that farming can be made less labor-intensive and more attractive to younger generation. As we have seen before, with production of energy from agriculture, farming can also become very remunerative. At the same time if some of you bright engineers from premier institutes go into farming then the rural youth may emulate you. Also very concentrated effort needs to be made by the advertisement agencies to make it glamorous. Once farming becomes remunerative it will also become glamorous!

Water issues

However, for farming to increase so that it can bear the load of food and energy production, adequate water supply has to be assured. To my mind supply of adequate water to rural areas and poor regions of the world is a much bigger challenge than even energy availability, and where you engineers and technologists can play an important role. Not only is there a water shortage, but lack of clean potable water results in millions of deaths every year due to diarrhea.

With the coming of green revolution in India, there has been an extensive use of water, resulting in shortage in some parts of the country. This is despite the fact that there is enough rainfall. Every year India receives ~ 4000 billion cubic meters of rainfall, whereas the present yearly water consumption is only 650 billion cubic meters or 16% of the total rainfall. Thus theoretically we have enough water, but the rainfall is not evenly distributed over India and it comes in short spells, thereby pointing to the need for rainwater harvesting and storage programs.¹²⁰

However, the issues of rainwater harvesting and its supply to the community in rural areas raise a question of who will own the water bodies. This is a touchy issue and quite a few developing countries are grappling with it. I feel there is a need for the local governments to develop policies so that rural water utilities can be set up which can harvest the rainwater, store and clean it and then supply this water to a village throughout the year. These water utilities may also be able to buy water from the government through the existing canal system. Presently, all the water utilities in India are owned by the government and this leads to corruption in supply of water and its very inefficient usage. In 2003, the Government of India passed an electricity act allowing for the first time the private players to produce, sell and distribute electricity anywhere in the country. This act has allowed power producers to break free from the clutches of inefficient and corrupt government power utilities. I feel a similar water act will help in the efficient supply of water to rural areas.

Two most important issues for rural development are water and electricity. NARI has developed a strategy whereby it is shown that a micro utility producing 500 kW_e power for rural areas can easily use the heat of the flue gases of the engine to boil or distil water to make it potable.¹²¹ Thus the combined cycle of electricity and water will increase the efficiency of the power plant. Besides, tremendous R&D is also needed in improving the distillation process so that minimum energy is used in effecting it.

I hope these examples have given you a feeling for what you can do to help the rural population. I also hope that these examples have given you a flair of how very sophisticated technology is required for solving the rural problems. The development of technologies can be done through a combined and concentrated effort of academia, corporate sector, S & T NGOs and government labs and where one day you will be leaders.

How helping others creates happiness?

However for an individual to work for the society it is necessary that he/she should be secure and happy. You can only give back to the society when your “personal infrastructure” is adequate. And now I will discuss about how to be secure and happy.

Happiness is a state of mind. You start feeling happy when you become internally secure. Deep thought or *Sanyam* helps in creating internal calmness and security. When you become honest with yourself and try to understand yourself deeply you start becoming internally secure (chapter 6).

You are all young. At this age the brain is at its peak. Thus it continuously seeks inputs to process them and without a focus results in jumping from one thought to another. This results in attention deficit disorder (ADD) that we often observe in youngsters. However if you learn through *Sanyam* or *Yoga* to focus on a single thought for a long time then this ability can be used in making the brain very powerful. A powerful brain becomes very innovative and sensitive to the surroundings and propels us to start changing our environment to make it better. This is the genesis of nation building. At the same time this powerful brain

or processor can analyze every situation very efficiently and gives us a perspective in life by providing internal security. This in turn makes us less greedy for materials and resources and helps us become sustainable in our lifestyle.

Every citizen of this earth aspires to a decent lifestyle. However with tremendous onslaught of mass media most aspire to have a lifestyle of western nations which is mostly unsustainable. For example, in U.S. the per capita energy consumption is 350 Giga joules (GJ)/yr, whereas in India it is a low of 18 GJ/yr.¹²⁰ If each citizen of India tries to live an American lifestyle then the whole world's energy resources will be needed only for India. I believe an emotionally satisfying lifestyle is possible with much less energy than is consumed by an average U.S. citizen. Thus an energy consumption of 50-70 GJ/person/yr or one-fifth that of the US, can provide a decent and emotionally satisfying lifestyle (chapter 27). This type of energy consumption will put much less pressure on earth's resources besides reducing substantially the environmental pollution. However it can be possible only if we follow the maxim of "simple living and high thinking".

I also firmly believe that with development of right technologies the lower energy consumption goal can be achieved. As some of you will become good engineers and scientists you can help to achieve it by providing right-sized technologies at the right "price" to the poor. It is a doable goal. What is needed is the desire and will on your part to make the difference to improve the lives of poor people.

With the reduction or removal of greed an individual becomes happy. A happy individual can then give back to society both knowledge and resources. This is the essence of environment improvement and nation building. Thus if we all work together for creating happiness in our personal lives and for nation building then India can teach the world a new way towards sustainable living. Also if we make India a happy place to live then we would have automatically solved the problems of 1/5th of mankind.

I will end this talk by telling you a story, a tale from our ancient scriptures, the *Puranas*. It is a typical Indian story of a sage and his disciples.¹²²

The sage asks his disciples, "When does the night end?" And the disciples say, "At dawn, of course." The sage says, "I know that. But when does the night end and the dawn begin?"

The first disciple, who is from the tropical south of India replies: "When the first glimmer of light across the sky reveals the fronds of the coconut trees swaying in the breeze, that is when the night ends and the dawn begins". The sage says "no".

So the second disciple, who is from the cold north, ventures: "When the first streaks of sunshine make the snow gleam white on the mountaintops of the Himalayas, that is when the night ends and the dawn begins".

The sage says, "No, my sons, when two travelers from opposite ends of our land meet and embrace each other as brothers, and when they realize they sleep under the same sky, see the same stars and dream the same dreams - that is when the night ends and the dawn begins".

I feel that when the bright young scientists and technologists like you will light up the lives of rural population through technology and resources, then it will bring in the dawn of a new age for India and the world.

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28. Simplifying Life

Each one of us should live sustainably in order to conserve the resources of this world. The consumptive life-style of western societies is putting tremendous pressures on the world resources besides increasing earth warming and pollution. For example an average American consumes 350 GJ/yr of energy¹⁰⁸. If every citizen of this planet wants to have the wasteful and consumptive life style of an average American then we will need the resources of 4 earths to sustain us.⁷⁹

Also those of us who work in the areas of sustainable development should try to live sustainably. I would therefore like to share with you my experiences in living a sustainable but decent and emotionally satisfying life. This lifestyle has evolved slowly over time and required some effort. I had lived in US for many years in 1970s and had imbibed the consumptive lifestyle of US. Coming and living in rural India taught me many things among which was spirituality and frugality. Both these things go hand in hand and have helped me live in the way I describe below.

I live in a small rural town called Phaltan in district Satara, Maharashtra, India where I run a small NGO called Nimbkar Agricultural Research Institute (NARI). We work in the areas of agriculture, renewable energy, animal husbandry and sustainable development.

My experiments in sustainable living for the last 25 years are as follows:

1. I live in a house designed by me and constructed in 1984. It is built of stone with 18" thick walls which allow tremendous thermal lag-time so heating and cooling due to ambient atmospheric temperature is delayed. It is passively cooled in the summer by laying old jute gunny sacs on the roof and sprinkling water on them two times a day. These sacs are very cheap and cost Rs. 10/m² (1US\$ = Rs. 47). The evaporating water from the sacs cools the roof from where 80% of

thermal load comes into the house. Thus when the outside temperatures are about 40-45°C the house is cool in the afternoon with average temperatures of rooms ranging from 25-30°C. This is mostly because of thick walls and cool roof. Besides we also close all the windows and draw the drapes over them so that hot air and radiation from outside does not come inside the house. The trees surrounding the house also help. In a couple of years or so the gunny sacs are worn out because of the salts left behind by the evaporating water. These old gunny sacs are either used as mulch in the garden or burned in our hot water boiler, which supplies water for our daily bath. The water boiler is a grate-type multifuel boiler with about a 10 m long chimney attached to it. This chimney height gives an excellent draught and hence burns the wood and other material quite cleanly. In fact the water boiler is used for burning lots of different things as explained below. The ash from this boiler is used as a fertilizer in our garden directly or by composting it.

2. Phaltan is around 800 m above sea level and is 100 km south-east of Pune or 300 km south-east of Mumbai. Its climate is very mild¹⁰⁹. Still in some years during winters the minimum temperatures can reach 6-7°C. Our house is not heated. We close the windows at night if needed and wear warm clothes and socks. It keeps us warm and comfortable.
3. All our kitchen waste is fed to rabbits (about 25-30 of them) who are housed in an enclosed cage in our garden. We do not eat them since we are mostly vegetarian. But use these rabbits to produce fertilizer (their droppings) which makes excellent manure in the garden.
4. All other items inedible for rabbits like egg shells, tea waste etc. are put in compost pit (with dimensions of about 1 m X 1 m X 1 m). After 2-3 months the output from this pit is used as a fertilizer in our garden.
5. We never waste any food. Whatever we take on the plate is eaten. The leftovers are either used next day or fed to our two

dogs and couple of cats. There is no special food for the pets. They eat whatever we eat.

6. We have a 2-acre plot on which our house is located. It mostly contains trees. Their leaf litter rots in the soil during rainy season and provides nice mulch. The dead branches and trees provide us the wood for heating our bath water in the boiler. In fact we always have surplus of wood so that we sell it and make a nice tidy sum.
7. When we purchased this land in 1981 it was completely barren and the quality of land was so poor that there would be huge cracks – big enough for small animals to disappear in them. We planted trees on it and in 25 years the leaf litter from the trees and the compost fertilizer has really improved the soil quality. The soil has therefore become springy and quite fertile.
8. Most of our groceries and vegetables are grown within 10-15 kms of our home. The eggs are from free range chickens, milk from cows across the road and vegetables and groceries from the local market. Most of these things are grown in Phaltan area. We use safflower seed produced on our Institute farm for crushing in local mill for oil. Thus the oil is fresh and without any chemicals.
9. Most of the time I still drive a 25-year-old Maruti 800cc car which transports me from point A to B comfortably. It gives me between 13-16 km/liter and is small enough to go in smallest of lanes and by lanes of Phaltan town. For long distance driving to Pune or Mumbai (300 km from Phaltan) I use Maruti Esteem which gives me 18-20 km/liter.
10. We have few clothes and they are worn till they get torn. They are then used in the house as dusters and wipers and after becoming tatters are used in the water boiler to heat the water.
11. I wear mostly *khadi* clothes (made from cotton spun in cottage industries). Thus I buy the cloth for my bush shirts and they

- are stitched by my tailor in Phaltan. This makes these shirts much cheaper than the ones purchased in the market. Khadi is a very comfortable material to wear for hot climates and also makes excellent dusters and wipers after the shirts get torn.
12. Similarly all the papers in the office are used for writing on both sides and the used ones are brought to our house to again heat our bath water. Thus everything is recycled.
 13. We use electricity sparingly – which is also facilitated by the Government of Maharashtra since we have 4-5 hours of power cut everyday! We have battery-powered inverters both in the offices and at home which supply enough juice for lights, fans and laptops only. So no TV or refrigerators run on them. During electricity cuts we walk, talk or read. This provides a good quality time to catch up on reading and discussions. Sometimes I think this is for the best as 24-hour electricity causes distraction with TV and other electronic media.
 14. We do not travel very much but communicate more by phones and internet and believe that this is much more energy-efficient way of keeping in touch. With availability of broadband internet connection both at home and in the office, it is an excellent communication and information medium.
 15. We bring most of our groceries and vegetables in cotton carry bags and hence have little garbage of plastic. Nevertheless we cannot get away from plastic as most things come already packed in it and this is the biggest nuisance we have. We have no way to recycle it. Presently we take the plastic bags and bottles to the local garbage dump from where they ultimately go to the recycling center. Still I feel we use much less plastic than most people. Nevertheless technology for recycling of plastics in rural areas is very much needed.
 16. We are teetotalers and drink only water, which is boiled. Thus the plastic bottles and cans of soft drinks do not litter our garden. Drinking only water is not only healthier but also helps the environment by not producing plastic bottle litter.

17. We buy only those things which are needed and since we live simply we do not need to buy too many things. We still use some of our 25-30 years old electrical gadgets and most of them are repaired when they stop working rather than being thrown away. This reduces the garbage production and at the same time is easy on the pocket book. Sometimes however when the equipment is 25-30 years old it cannot be repaired since the parts are not available. Thus we unwittingly add to the electronic garbage though we try to minimize it.
18. The main external inputs we use are electricity, petrol and LPG for cooking. Our per capita energy consumption (from last 2-3 years data) is 15.1 GJ/yr for electricity (both in offices and home), 12.7 GJ/yr in transport (mostly for petrol for 2 cars) and 1.75 GJ/yr in cooking gas. Thus we personally consume ~ 30 GJ/person/year of energy. To this should be added the energy in India's infrastructure which comes to about 10 GJ/person/year¹¹⁰. Thus our total commercial energy consumption is 40 GJ/person/yr. Contrast this with about 350 GJ/person/year that an average U.S. citizen uses¹⁰⁸. Thus in 1/9th the energy that is used by an average American citizen we can live quite decently in a modern industrial society.
19. Our low electricity consumption results since we use only fans and CFLs and almost no air conditioning. Even in our offices we use evaporative roof cooling. The low energy usage in transport is because on an average we travel only 15,000 kms/yr.
20. Similarly our average water consumption is 150 liters per person/day for household purposes. This is almost one-fourth that used by a U.S. citizen¹¹¹. Still we feel that our water usage can be further reduced.
21. Thus a satisfying and decent life style can be maintained in much less energy and water usage as compared to that in western societies and this is a lesson for our leaders who are hell-bent on following the Chinese and US patterns which are both very consumptive and unsustainable.

We can make the life style even more sustainable by using locally produced ethanol in our cars and scooters and also its use as a cooking fuel¹¹². Similarly production of electricity from locally available agricultural residues can further help in this process. However both these things will require a community effort together with certain policy changes by the Government of India. Nevertheless if all of us become internally secure through spirituality then it can help us in living sustainably and the pressures on resources of the country can be reduced. And with proper planning and enlightened policy of the Government, Indians can enjoy a very high quality of life without becoming over consumptive.

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Some Personal Experiences

I do hope you have enjoyed reading the book and it has given you ample food for thought. I would now like to share with you some of my personal spiritual experiences, which have shaped my life and led to this book.

I was born and raised in Lucknow, the capital of Uttar Pradesh. My father, Jagdish Prasad Rajvanshi, who was a freedom fighter was imprisoned in 1942 freedom movement in Delhi and then sent to Lucknow jail. In 1946 on his release from the jail he liked Lucknow so much that he decided to make it his home. Our first house was in Hazratgunj (center of Lucknow) and in 1960 we moved into a flat in Lalbagh near Hazratgunj. I went to a well-known missionary school called St. Francis High School. One of the things I hated about the school was its strict discipline (the headmaster was a terror) and wearing of tie. I still remember that the moment I was out of the gate of the school the tie was taken out and stuffed in the pockets of the shorts. Thus ruined, the tie had to be replaced periodically and this resulted in constant scolding from my mother. Somehow wearing the tie and speaking English symbolized to my young mind colonial control and this attitude might have come from the influence of my father. I therefore inculcated the habit of reading books in Hindi and became an avid reader of Indian folk tales.

On my thirteenth birthday in 1963 I was given a present of a Hindi translation of Mahatma Gandhi's autobiography. Reading this book completely changed my life. I became obsessed with it and read it continuously - in the process neglecting my studies and other activities. Gandhi's early years simply caught hold of my imagination and there arose a great desire to know about the religions of the world. How this leap took place I don't remember but it must have been triggered by reading Bhagwat Gita since this was Gandhiji's favorite book. I therefore embarked on the journey of reading all the religious books that I could get from the local library - Gita, Koran, Bible, Rigveda, Upanishads, Patanjali Yoga, Vivekchudamani, etc. As can be imagined, how much can

you absorb at the age of 13 or 14, but the desire to read all these books was intense. Nevertheless reading of Patanjali *Yoga Darshan* created a tremendous impression on my teenage mind since it showed that one could gain superhuman powers by practicing Yoga!

Together with the reading came the desire to practice some of the things that Gandhiji did. Thus I became totally vegetarian, started eating mostly boiled food and also started meditating. Meditation was done as described in Shri Ramkrishna's biography. The meditation, which sometimes lasted for one to two hours, produced wonderful feelings and dreams. I remember starting an experiment of meditating on my heart and visualizing that it contained a small earthen lamp. This resulted in a tremendous feeling of love and good feelings for everybody. If I remember correctly this must have lasted for a month or so but I got frightened by the experience and hence stopped the heart meditation. I tried repeating the same meditation many years later but was never able to duplicate the experience of love.

I also remember that during this time (especially during school holidays) I went for long walks of eight to nine kms. Most of my thinking has been done during long solitary walks and this habit has continued till today. Lucknow in early and middle 1960s was a beautiful city with lots of parks and my walks ended at cremation grounds near Dilkusha Gardens beyond the famous La Martinere School. Beautiful trees surrounded these grounds and since nobody would come there, it was very peaceful. I would often meditate sitting on the platform where the bodies were burnt. When my mother came to know about it much later on she scolded me to no end. I never felt any fear but just a sense of peacefulness.

After schooling in Lucknow, I entered Indian Institute of Technology (IIT), Kanpur in 1967 as an undergraduate student to study mechanical engineering. IITs are the most prestigious engineering colleges in India and perhaps in the world. One gets into them after an extremely competitive entrance exam. Thus in early years of my IIT days I got quite involved in studying

engineering and spirituality took a back seat. Somehow in the fourth year of my studies I got an intense desire to study the world literature. This could have been triggered by the humanities courses I took under an excellent professor. In those times IIT Kanpur had a first class library with a large literature section. Thus I read most of the books by great authors like Jane Austen, Knut Hamsun, Dostoyevsky, Tolstoy, Thomas Hardy, Thomas Mann etc.

I believe at the age of 19-20 years the brain is at its prime and so can absorb huge amounts of input information. Despite my intense literary readings I could still do reasonably well in my engineering and got good grades. However I felt that the best part of my IIT education was the study of humanities subjects and my ability to write this book is a direct outcome of that education. There is a general tendency among students of professional courses to give a step-motherly treatment to humanities but I believe study of such subjects gives one a well-rounded education. Hence I feel that humanities subjects should form a compulsory part of curriculum in all professional colleges.

The meditation and intense reading produced wonderful and remarkable dreams. Some of the vivid ones I can remember were:

1. I am running in the courtyard of our house in our village and a bright beam of light descends from the sky and hits my right side. My face and shoulder are totally engulfed by it. There was no fear - just a feeling of well being.
2. In another dream I saw a firebreathing dragon which would have killed me. I immediately recited the name of Lord Shiva. He appeared and gave me a bow and arrow with which I killed the dragon. I am sure both these dreams may have been influenced by some of the movies on holy people that I saw as a child.
3. One dream was really strange. I saw my younger brother and myself all alone in a desert. The skies suddenly opened up and a beam of bright white light bathed us both. But besides the light I also heard wonderful western classical music. Since

at the age of 13 or 14, I had no access to western classical music, this dream was something very strange.

4. One dream was of an out of body experience where I am in the battlefield and "killed". However the "I" remained and it could go anywhere and pass through walls and obstacles.
5. Another dream showed that I am travelling in a spaceship and witness the formation of galaxies in an egg-shaped envelope. This was really fantastic and psychedelic and could have come out of almost any science fiction movie.
6. In one dream I saw myself levitating by climbing on invisible steps. This dream came at the time when I was thinking deeply about gravity. A thought therefore came that probably gravity is quantized.

These types of dreams continued even later and there was a time (sometime in early 1970's) when I continuously had dreams of having discussions about the future of India with leaders like Mao, Trotsky, Lenin and above all with Gandhiji. There were many dreams of Gandhi. In one strange dream he even merged into my body!

The whole idea behind writing this is to tell the readers that these events did remain at the back of my mind and did help in preparing it for the work outlined in the present book. In fact it goes to show that once the mind gets prepared then it can tune into the relevant dimensional space and can start receiving knowledge.

Such knowledge did come out of the blue one day. I was doing my research for Ph.D. at University of Florida, Gainesville, USA in the area of thermal applications of solar energy. After lunch I was walking back from my home to the office through a thick pine grove when suddenly a thought came that gravity and human thought are somehow related. The idea (which occurred in later part of 1977) was so powerful that it caught hold of my mind for next 4-5 months and I could hardly concentrate on anything else. Since this idea came suddenly and so powerfully, I was convinced that it was true - otherwise it would not have come. Obviously

I can be charged with delusional thinking (I have not been able to provide a foolproof relationship between thought and gravity) but the idea seemed intuitively true that day and even today after more than 25 years later. I am sure my readings on gravity and attendance of lectures on cosmology at the University must have helped, but the idea came in a flash. This single idea propelled me to start writing on mind/matter interaction. Somehow I also felt that the pine groves acted as antennas for this thought!

In 1981 I came back to India from US to work on rural development in Maharashtra and somehow the work on thought, gravity and spirituality was again put on the back burner. Hence I did not do any serious study or write on them till 1991. In March 1991 I had gone to give guest lectures at Indian Institute of Technology (IIT), Bombay when I slipped in the IIT Guest house and nearly fractured my spine. The pain was the most severe I had in my life. Fifteen days later I started writing on spirituality and have never looked back. Strange are the ways of the Lord!

Thus what I have presented in this book is a distillation of all such experiences that I have had in my life till now.

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Notes and References

1. Patanjali Yoga Darshan is the oldest book on Yoga. It shows in a scientific way how to control thought. There are four sections in this book. They are Samadhi (absorption), Sadhana (practice), Vibhuti (powers), Kaivalya (liberation). It has 195 sutras with each section containing about 40-50 sutras (Sutra is a Sanskrit word meaning a precise maxim). There are innumerable commentaries and translations of the Sanskrit book. Most of them are literal translations of the Sanskrit sutras which makes it very archaic and difficult reading. I have drawn extensively from the following books :
 - a) Swami Prabhavananda, *Patanjali Yoga Sutras*, Shri Ramkrishna Math, Madras, 1990.
 - b) B.K.S. Iyengar, *Light on Yoga Sutras of Patanjali*, Harper Collins Publishers India, 1993.

The interpretations of Patanjali's sutras are however mine.

2. fMRI uses radio waves and a magnetic field tens of thousands of times stronger than the earth's field to pick out variations in blood and oxygen supply to different tissues of the brain, which is highlighted in the image on the computer screen. There have been cases of many Yogis who have refused to be put under MRI machines saying that it interferes with their thinking. Ref. Laura Spinney, "The Mind readers", *New Scientist*, Vol. 175, No. 2361, 21 Sept. 2002, pg. 38-41.
3. The brain has about 100 billion neurons (the exact number is not known). Each neuron connects to other neurons via thousands of dendrites or axons. Thus the brain has a minimum of about 10^{14} connections to play with. The brain also has glial cells, which outnumber neurons nine to one. These cells can modify the neuron signals and with each neuron having its own firing characteristics, the number of permutations and combinations for memory formation are mind-boggling. Ref: R. Douglas Fields, "The Other Half of

- the Brain", *Scientific American*, Vol. 290, No. 4, April 2004, pg. 26-31.
4. Patanjali has described *Sanyam* as a combination of dhyana (meditation), dharana (concentration) and samadhi (complete absorption). When these three attributes are brought to bear on any object its complete knowledge results.
 5. Concept of Dissipative energy structures was developed by Ilya Prigogine who got the Nobel Prize for his work on nonlinear thermodynamics in 1977. His two famous books are. (1) Ilya Prigogine, *From Being to Becoming*, W. H. Freeman & Co., 1980. (2) Ilya Prigogine and Isabelle Stengers, *Order out of Chaos*, Flamingo, London, 1985.
 6. The free convection in a fluid body heated from below produces hexagonal cellular structures. These structures were first observed by Benard in 1900 and hence they are called Benard cells.
 7. Edward N. Lorenz, *The Essence of Chaos*, University of Washington Press, Seattle, 1993.
 8. Steven Strogatz, *SYNC – The Emerging Science of Spontaneous Order*, Theia, New York, 2003.
 9. Brain is full of sexual chemicals like dopamine, serotonin, oxytocin, vasopressin etc. These chemicals help in increased neurotransmitter activity and memory enhancement. Good references are : (1) "I get a kick out of you – The Science of Love", *The Economist*, Vol. 370, No. 8362, February 14, 2004, pg. 66-68. (2) Helen Fisher, *Why We Love: The Nature and Chemistry of Romantic Love*, Henry Holt and Company, N.Y., 2004.
 10. Stephen S. Hall, "The Quest for a Smart Pill", *Scientific American*, Vol. 289, No.3, September 2003, pg. 36-45.
 11. Mark S. George, "Stimulating the Brain", *Scientific American*, Vol. 289, No.3, September, 2003, pg. 46-59.

12. Ref.1, Sutra IV. 1.
13. Out-of-body experience; www.fact-index.com/o/ou/out_of_body_experience.html
14. Olaf Blanke, *et al.*, "Stimulating illusory own-body perceptions", *Nature*, Vol.419, 19 September, 2002, pg. 269.
15. Ref.1, Sutra III. 39.
16. Sanskar is a Sanskrit word meaning subliminal impressions or memory.
17. Joshua T. Trachtenberg *et al.* "Long-term in vivo imaging of experience-dependent synaptic plasticity in adult cortex", *Nature*, Vol. 420, 19/26 December 2002, pg. 788-794. Also Ole P. Otterson and P. Johannes Helm, "How hard wired is the brain?", *Nature*, Vol. 420, 19/26 December 2002, pg. 751-752.
18. Andrew B. Neuberg, *Why God Won't Go Away*, Ballantine Books, 2001. The basic finding is that human brain is hard wired for religion and is set up in such a way as to have spiritual and religious experiences.
19. There are two excellent books on higher dimensional space and superstring theory.
 - a) Brian Greene, *The Elegant Universe*, Vintage Books, March 2000.
 - b) Michio Kaku, *Hyperspace*, Oxford University Press, 1994.
20. Michael D. Lemonick, "Before the Big Bang", *Discover Magazine*, Vol. 25, No. 2, February 2004. A nice article on higher dimensional membrane research.
21. The 11th Chapter in Bhagwat Gita deals with Lord Krishna showing Arjun- the Warrior, the cosmic form of God or the birth and death of cosmos. This awe-inspiring event made the hair on Arjun's body stand up. The Gita was written about 5000 years ago though the description of Virat form is very similar to the black hole process. Virat is a Sanskrit word meaning huge.

22. An excellent book on Einstein and his scientific work is his scientific biography; Abraham Pais, *Subtle is the Lord – The Science and Life of Albert Einstein*, Oxford University Press, 1982. At the age of 12 Einstein used to compose poems about God which he sang to himself (pg. 489). According to Einstein's relativity theory, space and time are interconnected. At speeds approaching that of light both space and time contract and can nearly become zero. Thus time can stand still.
23. Every signal emanates and spreads from a source in concentric spheres. The area of sphere increases in proportion to its radius squared and the strength of the signal decreases by the same amount since it has to cover the whole sphere. This is the basis of $1/d^2$ law.
24. Earth takes one year to move around the sun. The plane of earth's orbit changes every year. The solar system moves around the Milky Way (our galaxy) once in 226 million years. Our Milky Way galaxy moves around the center of the universe. Thus the earth hardly ever occupies the same space again.
25. One of the great periods in human history is 19th century (1800s) when people like Darwin, Einstein, Faraday, Edison, Ramakrishna, Gandhi, Marx, etc. were born. All of them created revolution in the thinking of mankind. Such instances have also taken place during renaissance and earlier periods when great souls were born nearly at the same time.
26. Heat engine is a device which produces work by the flow of heat from a higher temperature source to lower temperature sink. The definition of heat engine was given by a French engineer Sadi Carnot in 18th Century. All energy-producing devices follow this principle. Thus an automobile engine produces mechanical power by using the heat of petrol or diesel (source) and throwing out the hot flue gases as exhaust to the environment (sink). For devices which use chemical

energy to do work (for example muscles) the temperature difference of heat engine is replaced by chemical energy difference.

27. Quantum jump has been used in describing the transfer of electrons in an atom from one energy level to another by a fixed amount of energy (quanta). This was the revolutionary idea of Max Planck in early 1900's who defined light as a quantum or a packet of energy.
28. *Vivekachudamani of Shri Shankaracharya*. Translated by Swami Turiyananda, Shri Ramkrishna Math, Madras, 1991. Adi Shankaracharya lived in seventh century AD and was one of the great saints and historical figures of India. He is a part of the long list of spiritualists born in India who have produced and interpreted the great Yogic traditions of India. He called Akash as the ultimate reality into which everything devolves (pg. 176).
29. Lyall Watson, *SUPERNATURE II*, Sceptre, 1986, pg. 211 (good source regarding data on psychokinesis, poltergeist, etc.)
30. In 1947, William Shockley, John Bardeen and Walter Brattain invented transistor in Bell Labs, U.S. Termed as one of the greatest inventions of the twentieth century, this development ushered in the modern electronic and computer age. In 1957 the trio was awarded the Nobel Prize for Physics.
31. Shri Ramkrishna was a great saint of India. He was born in Bengal in 1836 and was a great exponent of Bhakti Yoga (Ref. 41). His most famous disciple was Swami Vivekanand who went to U.S. to attend the World Religion Conference in Chicago in 1893. He later preached and set up in U.S. centers about Vedanta and Indian philosophy. Though Ramkrishna was illiterate yet his innumerable visions tally quite accurately with the findings of modern cosmology. A good book on these visions is *Visions of Shri Ramkrishna*, Shri Ramkrishna Math, Chennai, 1989 (pg. 60). Ramkrishna left his body by will through Samadhi.

32. Ref.1, Sutra III. 47.
32 (a) Ref. 1, Sutra I. 41.
33. According to Einstein's General Theory of Relativity a massive body bends space-time continuum around it. This change in geometry of space results in the gravitational effect. One of the best treatments of gravity and mass has been given in a book entitled *A Journey into Gravity and Space time*, by J. A. Wheeler, Scientific American Library, 1990.
34. Ref.1, Sutra III. 43.
35. Mahabharata is an Indian epic written sometime between 3000-4000 B.C. (the exact date is unknown). The epic is about a great war fought between cousins Pandavas and Kauravas over the control of kingdom. The famous Indian philosophical book Bhagwat Gita is the advice given by Lord Krishna to Arjun (Pandava) at the start of the epic war. During the war the commander of Kaurava army-Bhishma Pitamah was felled by Arjun's arrows. He remained on the bed of arrows for almost 6 months and left his body by will on winter solstice (when sun is nearest to the earth).
36. *Life of Swami Vivekanand by his Eastern and Western Disciples*, Advaita Ashram, Calcutta, 1979. pg. 645 about his death or Mahasamadhi.
37. S. Radhakrishnan, *The Brahma Sutra*, Published by George Allen and Union Ltd., London. 1960. The Brahma Sutra was supposedly written by one Badarayana sometime in second or third century BC. It is the exposition of the philosophy of Upanishads and tries to systemize their various strands.
38. Peter Lemesurier, *The Great Pyramid Decoded*, ELEMENT, Australia, 1977, pg. 7. If the height of the pyramid from its base is H, then the King's and Queen's burial chambers are located equidistant at $H/12$ above and below the center of gravity of pyramid respectively.

39. There are generally four types of rhythms in the brain. A deep sleeping brain produces 1-4 Hz waves (delta rhythm) while during dreaming the cycles are 4-7 Hz (theta rhythm). In conditions of relaxed awareness, which most yogis get into during meditation, the rhythm is called alpha with frequencies of 8-13 Hz. The fully awake rhythm is 13-30 Hz (beta). Ref. 29, pg. 129.
40. Bob Holmes "Radio hum may herald quakes", *New Scientist*, Vol. 148, No. 2009/2010, 23/30 December 1995.
41. Bhakti Yoga is one of the four Yoga systems of Indian philosophy. Others are Jnana (Knowledge), Raja (based on Patanjali system) and Karma (work) Yoga. The main tenet of Bhakti Yoga is the intense love of individual soul (atman) for the Universal Consciousness (paramatman) which helps in liberation and ultimate realization. Shri Ramkrishna was a proponent of this system.
42. According to Sankhya philosophy Purusha (universal awareness) and Prakriti (nature) work together to produce universe. Purusha is male and Prakriti is female. They are the products of "ultimate reality" Iswara and merge back into it during the space closure. Similarly Vedantists believe that when Pran (the life force) acts on Akash (ether) universes are formed. Ref. 37, pg. 95.
43. S. Radhakrishnan, *The Principal Upanishads*, Harper Collins Publishers, India, 2003, pg. 638 (Katha Upanishad II. 2.7).
44. Ref.1, Sutra IV. 3.
45. Raymond A. Moody, *The Light Beyond*, Bantam Books, 1988.
46. Sogyal Rinpoche, *The Tibetan Book of Living and Dying*, Rupa & Co., 1998, pg. 102-104.
47. Ref.1, Sutra I.50.
48. Ref.1, Sutra III. 23.

49. Robert Kanigel, *Man who knew Infinity – A life of Genius Ramanujam*, Rupa & Co., New Delhi, 1992, pg. 66.
50. Naomi I. Eisenberger, et al., "Does Rejection Hurt ? An fMRI study of Social Exclusion", *Science*, Vol. 302, October 10, 2003, pg. 290-292.
51. Vasant G. Rele, *The Mysterious Kundalini*, D. B. Taraporevala Sons & Co., Bombay, 1967.
52. Ref.31, pg. 12.
53. Ref.1, Sutra IV. 33.
53(a) Ref. 1, Sutra III.52
54. Paramhansa Yogananda, *Autobiography of Yogi* , Paramhansa Yogananda Self-Realization Fellowship, LA 1979, pg. 355.
55. Sant Gyaneshwar. A great Indian saint of Maharashtra was born in 13th century AD. He rewrote the Bhagwat Gita in Marathi (the local language) so that it could become accessible to common man. This book is called Gyaneshwari. It is said that he left his body by will at the age of 21.
56. There are close to six hundred thousand sites on reincarnation in Google search engine on the Internet. However one of the most thoroughly searched scientific accounts of reincarnation is by Professor Ian Stevenson (University of Virginia department of Psychiatry) who in the last 40 years has thoroughly documented around 3000 cases of children from all over the world who remember their previous lives. The following references are on his work :
 - www.healthsystem.virginia.edu/internet/psychiatric/stevenson.cfm.
 - www.near-death.com/reincarnation.html
 - Ian Stevenson, *Where Reincarnation and Biology Intersect*, Greenwood Publishing Group, Inc. 1997.
57. Shri Ramkrishna has given a very vivid description in his own words of who Swami Vivekanand was : 'One day in samadhi I saw that my mind, going up a luminous path,

went beyond the gross world studded with the sun, moon, and stars; and entered first into the subtle world of ideas. The more it ascended to higher and higher strata of that realm, the more did I see beautiful ideal forms of gods and goddesses existing on both sides of the path. I came gradually to the end of that region. I saw that a fence made of light separated the realm of the divisible from that of the indivisible. Leaping over that fence, the mind entered by degrees the realm of the indivisible. No person or thing having a form existed there. As if afraid to enter there, even the gods/goddesses possessing heavenly bodies only exercised their authority over realms far below. But the very next moment I saw seven Rishis having bodies consisting of divine light only, seated there in samadhi. I felt that in virtue and knowledge, love and renunciation, they had excelled the gods and goddesses, not to speak of human beings. Astonished, I was pondering over their greatness when I saw before me that a part of the homogeneous mass of Light in this abode of the indivisible, devoid of the slightest tinge of difference, became solidified and converted into the form of a divine Child. Coming to one of those Sages, and throwing its soft delicate arms around his neck, it embraced him, and then calling him with a voice sweeter than the music of the vina, made great efforts to wake him from samadhi. The sage did wake up, and with half-shut eyes beheld the Child. I, seeing his bright expression full of delight, thought that the Child must be the treasure of his heart – that their familiarity was of eternity. The extraordinary divine Child then expressed great joy and said to the sage, "I am going to earth you must come with me." The sage did not reply, but his loving eyes expressed his assent. Looking on the Child with eyes of love for some time, he entered again into samadhi. I was astonished to see that a part of the mind and body of that Rishi, converted into the form of a bright light, came down to earth along the luminous path. Hardly had I seen Narendra (Swami Vivekanand) when I knew that he was that Rishi.' Ref. 81, pg. 83-84.

58. Ref.1, Sutra I. 33.
59. "What caused the Mass Extinction? A Debate", *Scientific American*, Vol. 263, No. 4, October 1990, pg. 42-61.
60. Day dreaming in children. Quite a number of parents and sociologists incorrectly lump day dreaming in children with Attention deficit disorder (ADD).
61. Gravity and Newton apple. It is generally assumed that a falling apple gave Newton the idea of Universal Gravitation. He correctly conjectured that the force of attraction from earth on a falling apple is similar to that for the moon which is also falling to earth and in the process gets an elliptical orbit around the earth. There is no documentary proof that Newton actually got the idea when an apple fell on his head. However the myth has continued.
62. "One day in 1908 a painter fell off the roof to the ground. After hearing of the accident Einstein inquired of the painter how it felt to fall. He learnt that painter felt no weight at all. At that point there came to Einstein what he later described as the greatest idea of his life." J.A. Wheeler, *A Journey into Gravity and Space-Time*, Scientific American Library, 1990, pg. 11.
63. REM (rapid eye movement) is the phase during sleep when the dreams occur. It is accompanied by enhanced brain activity and also occurs in most animals. Subjects woken up during REM generally remember their dreams. Ref.: J. Allan Hobson, *The Dreaming Brain*, Basic Books, N.Y., 1988, pg.13.
64. Queen Maya dreaming about the impending birth of Buddha. Ref. Iqbal Singh, *Gautam Buddha*. Oxford India Paperbacks, 1994.
65. Ramkrishna's mother dreamt that God in the form of a small green person is telling her that he will be born in her house. *Shri Ramkrishna -The Great Master*, Shri Ramkrishna Math, Madras, Vol. 1, 1991.

66. Sleep and Dreaming, *New Scientist*, Vol. 178, No. 2401, 28 June 2003.
67. Definition of bell curve or normal distribution. The data are distributed in such a manner that the most preferred or probable value has a central peak and the rest of the data is distributed in a bell shape on either side of this value. For example in a classroom, maximum number of students will have height close to an average height. However there will be few students who will be tall and few of them will be short. A graph of the number of students vs. their height will yield a bell curve.
68. This is a beautiful story from Mahabharat (the epic has lots of such stories). Eklavya came from a poor shudra (untouchable) family. He wanted to become a great archer and hence approached Dronacharya - the greatest guru of archery. Dronacharya being a brahmin refused to teach Eklavya - the shudra boy. Dejected, Eklavya started practicing his archery with the bust of Dronacharya in his compound. One day a dog came and started barking and disturbing Eklavya while he was practicing his archery. Eklavya with his tremendous skills closed the dog's mouth with arrows without hurting him. This dog was spotted by Dronacharya who immediately knew that it was the work of an archer of highest order. He followed the dog and reached Eklavya's compound. Eklavya was very thrilled with the visit of the great guru to his house. Dronacharya asked Eklavya under whose tutelage he was learning his archery to which Eklavya pointed to the bust in the compound. Dronacharya could not believe that a boy can learn so much from simply visualizing a guru and knew that Eklavya was no ordinary boy and will one day even beat in archery his greatest disciple Arjun. So in a cunning and ruthless display of his nature he asked Eklavya for the *guru dakshina* (offering from the disciple to the guru). Eklavya replied that whatever he wished would be given to him. Dronacharya then asked for his right hand thumb, which Eklavya immediately chopped with a knife and gave to him.

69. Word from various religions. www.ruhanisatsang.org/naam/naam or Word Evidence from various religions.htm. Also <http://www.santmat.net>
70. Ref.1, Sutra I. 27.
71. Primordial wave in early Universe. *New Scientist*, Vol. 180, No. 2419, 1 Nov. 2003 pg. 16.
72. The original word is variously called Brahma Nad (Universal sound), Pranav, etc. In later scriptures it is called OM.
73. A. Abbott, "Music, Maestro, please!" *Nature*, Vol. 416, 7 March 2002, pg. 12-14.
74. It is said that Archemedes was taking his bath in a tub when the idea of specific gravity or relative density came to him. He got so excited that he ran out naked in the street crying Eureka (I have found it).
75. Panchatantra is one of mankind's oldest books of tales. It is supposed to have been written by one Vishnu Sharma sometime in 3rd century BC to educate three half witted princes in the art of statecraft. Both the dates and the authorship are little uncertain. To the western world Panchatantra was first introduced via translation in Persian in AD 570. Ref. Vishnu Sharma, *Panchatantra*, Penguin Books, India, 1993, pg. 360.
76. The hallmark of evolution is the spontaneous emergence of increasing complexity and order. This produces the branching from the older system. This spontaneous emergence can be explained by Prigogine's theory of dissipative structures. Ref. Fritzof Capra, *The Web of Life*, Flamingo, 1997, pg. 222.
77. According to Indian legend the demon Bhasmasur meditated on Lord Shiva for many centuries. Pleased with his meditation, Lord Shiva asked him to select a boon. Bhasmasur asked for powers to reduce to ash anybody on whose head he placed his hands. Armed with this power he chased Lord Shiva

thinking that if he kills Lord Shiva he can marry his beautiful wife Goddess Parvati. Lord Shiva ran for his life and took shelter with Lord Vishnu and requested his help. Lord Vishnu understanding the gravity of situation disguised himself as a beautiful woman called Mohini and approached Bhasmasur who was on his way to destroy Shiva. She told him that Parvati will not marry anybody who is not a great dancer. Bhasmasur taken by Mohini's charm and logic agreed to learn dancing from her. As a part of a clever dance posture Mohini urged Bhasmasur to place his hands over his own head and so he was immediately burnt to ashes.

78. Dina F. Mandoli and W. R. Briggs, "Fibre Optics in Plants", *Scientific American*, Vol. 251, No. 2, August 1984, pg. 80-88.
79. Edward O. Wilson, *The Future of Life*, Alfred A. Knopf, 2002, pg. 119.
80. Robert Costanza, et al., "The value of world's ecosystem services and natural capital," *Nature*, Vol. 387, 15 May 1997, pg. 253-260. The value is \$ 16-54 trillion with an average of \$ 33 trillion/year. GDP of world in 1997 was \$ 18 trillion.
81. Ref. 79, pg. 14.
82. Ref. 79, pg. 140.
83. Seth Dunn, "Micropower : The Next Electrical Era", *Worldwatch Paper 151*, Worldwatch Institute, Washington DC., July 2000.
84. Ref. 79, pg. 23.
85. Rajvanshi, A. K., "Talukas can provide critical mass for India's sustainable development", *Current Science*, Vol. 82, No. 6, 25 March 2002, pg. 632-637.
86. Amory B. Lovins, "Soft Energy Technologies", in *Annual Review of Energy*, Vol. 3, 1978, pg. 477-517. Published by Annual Reviews Inc., USA.

87. Gandhi and industrialization. Gandhiji said many times that he is not against industrialization but it should be with a human face and should provide employment to majority of rural population. D. G. Tendulkar, *Mahatma*, Publications Division, Ministry of Information and Broadcasting, Government of India, Vol. 4, pg. 1-14, 1952.
88. William L. Shirer, *Gandhi A Memoir*, ABACUS, 1981, pg. 233.
89. Story of Narad Muni and Indra. Lord Indra (King of heavens) wanted to teach sage Narad about the powers of Maya (illusion). He asked Narad to get some water from the river. On reaching the river Narad met a beautiful woman with whom he fell in love and married her. In the process he forgot about his mission and remained with his wife for 12 years before Lord Indra appeared to him in a vision to remind him about it.
90. The Sanskrit word Maya means illusion. According to Indian philosophy the whole world is an illusion and only Brahma or Universal Consciousness is the reality. Thus when humans remove the veil of Maya through Yoga then they can see Brahma.
91. Shankaracharya and Mishra couple. It is said that the learned Mishra couple engaged Adi Shankaracharya in an intellectual duel regarding the superiority of householder's life over that of monk's. Shankaracharya defeated the husband but was stumped by Mishra's wife Bharati who chose the subject of sex. She said that Shankaracharya had no knowledge of householder's life since he was a monk and hence could not duel on this subject. Shankaracharya was taken aback by the reply and asked for some time. By his yogic powers he entered the body of a recently dead king and started enjoying his wives and the power. He got so involved in his new role that he forgot who he was. His worried disciples disguised as wandering musicians went to his court and sang songs telling him about his true self where upon Shankaracharya

realized who he was and left the King's body and returned in his old body to Bharati for the duel. With her yogic vision she immediately knew what had transpired and gladly accepted him as her guru. Ref. 1(a), pg. 136.

92. Indian caste system is based on the concept of Varna (Sanskrit word Varna means color). There are four castes – the highest caste is Brahman, next come the Kshatriya (warrior class), then Vaishya (the business class) and finally the Shudra (untouchables or lowest caste). It is quite possible that Brahman's were whites, Kshatriyas were Mongolians and Shudras were blacks. The progeny of any inter caste union were called Vaishyas.
93. Ref. 31, pg. 130.
94. Konstantin Tsiolkovsky (1857-1935) is considered as a father of Russian rocketry. A totally self- made rocket engineer he clearly showed for the first time the difference between rockets and aircraft. He was the first one to develop multistage rocketry theory and to suggest in 1903 that liquid fuel will be better than solid fuel for space travel.
95. Robert Goddard (1882-1945) – A U.S. engineer who was a pioneer in the field of rocketry. His work in use of liquid fuel propellants for rockets paved the way for all modern space flights.
96. Ref.1, Sutra III. 49.
97. According to Brahma Sutra the soul can go to four places (lok). Swarglok (heaven) – the abode of gods and goddesses; Narak Lok (hell); birth on this planet or be liberated so that it is not born again.
98. Hang gliding as a spiritual experience; www.savenrg.com/muley.htm
99. Eugene Cernan and Donald A. Davis, *The Last Man on the Moon*, St. Martins Press, N.Y., 1999.

100. Robert Oppenheimer's description of the first atom bomb test at Trinity was to repeat Lord Krishna's words to Arjun (Chapter 11 of Gita) – "I am become death, the shatterer of worlds". Ref. Peter Goodchild, *J. Robert Oppenheimer – Shatterer of Worlds*, Houghton Mifflin Company, Boston, 1981, pg.162.
101. Barry Schwartz, "The Tyranny of Choice", *Scientific American*, Vol. 290, No.4, April 2004, pg.42-47.
102. Ref. 1, Sutra I. 41.
103. Becoming, which has been used quite regularly by existential philosophers like J.P. Sartre, etc., denotes change, flux or movement.
104. K.R. Srinivasa Iyengar, *Sri Aurobindo – Biography*, Published by Sri Aurobindo Ashram Trust, Pondicherry, 1972, pg 260.
105. Oliver Morton, "Solar Energy: A new day dawning?" *Nature*, 443, 7 September 2006.
106. In last years of his life Mahatma Gandhi carried out experiments on testing his celibacy resolve. Thus he would sleep naked with his nieces and said that he never felt any carnal desire and would go to sleep immediately. In doing this he was following a long tradition of such experiments done by various yogis; the latest documented case was that of Shri Ramakrishna who used to sleep naked with his wife and would go into *Samadhi* and loose consciousness the moment he wanted to touch her naked body. Why Gandhiji wanted to test his resolve in this manner was never clear. Nirmal Kumar Bose, Gandhiji's secretary during this phase of his life has written about it in his book. Ref. N.K. Bose, *My Days with Gandhi*, Sangam Books, London, 1974, pg 133.
107. "Virtually Engineering Power Plants", www.sciencedaily.com/releases/2009/07/090713085451.htm.
108. Vaclav Smil, *Energy at the Cross Roads*, The MIT Press, USA, 2003, pg. 7.

109. A. Jacob and A.K. Rajvanshi, "Long term Weather Trends in Western Maharashtra", www.nariphaltan.org/weather.pdf
110. Integrated Energy Policy, A document published by Planning Commission, Government of India, New Delhi, August 2006.
111. "Residential Water Use Summary", American Water Works Association Research Foundation, www.aquacraft.com/publications/resident.html.
112. Anil K Rajvanshi, "Ethanol lanstove for rural areas", www.nariphaltan.org/lanstove.pdf
113. Anil K Rajvanshi, "R&D strategy for lighting and cooking energy for rural households", *Current Science*, Vol.85, No.4, 25 August 2003.
114. Anil K Rajvanshi, "Langmuir approach to rural development", *Current Science*, Vol.95, No.7, 10 October 2008.
115. Unicef data on Indian mortality rates. www.unicef.org/india/health_491.htm
116. UN report on urbanization of India. www.un.org/apps/news/story.asp?NewsID=25762
117. Anil K Rajvanshi, S. M. Patil and B. Mendonca, "Low-concentration ethanol stove for rural areas in India", *Energy for Sust. Dev.*, Vol. XI, No.1, March 2007.
118. Anil K Rajvanshi, "Renewables the way forward for India", Opinion piece in *Sci. Dev.Net*, April 1, 2009. <http://www.scidev.net/en/climate-change-and-energy/biofuels/opinions/renewables-the-way-forward-for-india.html>
119. Anil K Rajvanshi and N. Nimbkar, "Sweet Sorghum R&D at Nimbkar Agricultural Research Institute (NARI)", Proceedings of the First European Seminar on Sorghum for Energy and Industry, Toulouse, France, Published by Ademe and INRA, Paris, France. April 1-3, 1996.

120. Anil K Rajvanshi, "Energy for the rural poor – challenge for the global community", *Current Science*, Vol.93, No.5, 10 September 2007.
121. Anil K Rajvanshi, Electricity and Water Revolution for Rural India, Editorial article in *Times of India*, 27 July 2005.
122. S. Tharoor, *Bookless in Baghdad: reflections on writing and writers*. Arcade Publishing, N.Y. 2005. pg. 266.

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